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SELECTED ECONOMIC TRANSLATIONS ON CZECHOSLOVAKIA

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FOREWORD

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INTRODUCTION

This is a serial publication containing selected translations on all categories of economic subjects and geography. This report contains translations on the subjects listed in the table of contents below.

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MODERN TRENDS IN THE PRODUCTION OF COMBINED FERTILIZERS

[Following is a partial translation of an article by Miroslav Cerny, Minister of the Chemical Industry and Jan Cerny, Chemoprojekt, published in Chemicky Prumysl (The Chemical Industry), No 5, May 1960, Prague, pp 230-231]

The production of compound fertilizers in Czechoslovakia has not expanded very substantially. It is true citramfoska has been produced for 25 years but only to a limited extent. It is a mixed fertilizer prepared by mixing citrophosphate, ammonium sulphate and potassium salts. The main component of this fertilizer, citrophosphate, is essentially a secondary calcareous phosphate produced by decomposition of Kola concentrate by about 50% nitric acid and coagulated milk of lime with a M_gO content. The resulting precipitate is filtered on Imperial vacuum filters and dried for the finished product. The residual solution of calcareous nitrate is processed for calcareous saltpetre.

Citramfoska has the following composition according to CSN [Ceskoslovenske Statni Normy, "Czechoslovakian State Norms"] 68 3093:

N	7 ± 1 %
P_2O_5	11 ± 1.5%
K_2O	17.3 ± 2%

The disadvantage of this method of production is the great amount of residual diluted solutions of calcareous phosphate that has to be concentrated in the production of calcareous saltpetre.

Czechoslovakia's agriculture until recently required only simple fertilizers that permitted adjustment of the nutrients in the various fertilizers. With the completion of socialization of the villages objective conditions set in for the widespread use of combined fertilizers. On the basis of detailed technical and economic studies and the results from the research laboratories, new plants for combined fertilizers will be put up in the Third

Five-Year Plan. The suitability of these investments is further supported by the fact that the calculated production costs for one ton of P_2O_5 in combined fertilizers in view of the present costs of raw materials and power amount to about 60 to 80% of the production costs for one ton of P_2O_5 in superphosphate according to the size of the production unit, the choice of technology and the composition of the finished product.

The determining factor in the choice of technology and the size of the fertilizer plants is the results of agricultural research. According to the preliminary results of Czechoslovakia's agricultural research in 1959 it was confirmed that there is no difference in the effects of simple and combined fertilizers in soils that are rich in P_2O_5 and K_2O, regularly limed and well supplied with humus.

In the fertilizing system the combined fertilizers will have to be alternated with simple ones and the individual requirements of plants and the effects of the previous crop and the soil properties will have to be allowed for. This will be accomplished by choosing the right kind of fertilizer. Such procedures will be adopted for the production of combined fertilizers that the proportion of nutrients varies in three ranges from $N; P_2O_5 : K_2 = 0.6:1:1$ to $2:1:1$, and also that the phosphoric acid content soluble in water meets the farmers' requirements.

CSO: 4036-D

THE DEVELOPMENT OF COKING IN CZECHOSLOVAKIA

[Following is a translation of an article by Engineer J. Kokstain in Paliva (Fuels), Vol XL, No 5, May 1960, pages 145-146.]

If we are to give a survey of the Czechoslovak coking industry and evaluate the development of coke production in its cradle, i.e., in Ostrava, we will note several outstanding periods in its history which keep pace with the development of coking technology in the other European countries whose coking industry is also mature.

Monographs on the Ostrava-Karvinna coal basin dated 1884 and 1931, and symposia on "Technical Work in Ostrava" of 1926, 1936 and 1946 contain statements by various coke technicians that Ostrava coke from the beginning of its production was noted for its good quality, not only because of the excellent qualities of the coal used, but also because of the relatively high level of coking technology which, in individual developmental periods, was not inferior to that of other mature coking countries such as England, Belgium, France, and Germany.

The mining societies in the Ostrava region always devoted the greatest care to coke production, both because of capitalist competition and because of their awareness of the great economic advantage which coke production meant. This is because coking as a refining process increases the value of coal by as much as 30%.

Ostrava coke has long had a reputation as the best coking coal in Central Europe; it was even better than Lower-Silesian, and incomparably better than that from Upper Silesia. Because of its excellent quality and the opportunity for sales on the markets of Austria-Hungary its production rose from 195,100 tons in 1882 to 3,115,200 tons in 1929.

It is very interesting and instructive to follow the appearance and growth of coking plants beginning in the 1830's. Some of these plants disappeared in the course of time, while others have remained to the present day.

Because of their dimensions and material (firebrick) the original coke furnaces were small and had a small daily output. Therefore a large number of furnaces were built and operated, and then, after 10 or 20 years, replaced with better and more productive ones. At the larger coking plants, such as Ignat (Sverma), Karolina, Frantisek (Vitezny unor), Jan (Cs. armada), etc., over a period of time the hundreds of furnaces of the most varied types built by well-known domestic and foreign firms (Gobiet, Biedermann, etc) were replaced.

First piles were built, resembling the system of burning wood to produce charcoal. Then simple enclosures were made, flame furnaces which did not use the by products; then furnaces using the waste heat. After the 1880's regenerating furnaces (particular those of Otto-Hoffmann) were used, and after 1950 [sic] furnaces retaining the chemical byproducts (mainly produced by Koppers).

By the end of the 1930's the development of coking furnaces was basically completed, as regards efficiency of firing and the possibility of saving coke-oven gas for other purposes (double firing with lean gas). And the basic methods of saving and processing chemical products and excess coke-oven gas (nitrogen plants) were also known. Subsequent efforts of the coke technicians were directed toward increasing the capacity of furnaces and batteries, increasing the yields and variety of chemicals, producing various types of coke, mechanizing heavy and strenuous work, and thus increasing the efficiency of production and raising labor productivity.

The fact that ways to modernize coke production were sought in the Ostrava-Karvinna region is shown by the fact that in 1926 the dry quenching of coke was set up at the Karolina coking plant. Despite successful operation, however, this was stopped after a few years. The reasons for stopping this production would not hold today: the poor appearance of the coke -- the matte coloration of the coke, increased abrasion of the coke when passing through the cooling tower, sufficient coal sludge to produce steam. Today we would judge the coke by its behavior in blast-furnace operation rather than by its color, and its passage through the cooling shaft would help to even out the granularity.

The great reserve capacity of the coking plants was never fully utilized except for peak periods of economic boom. Also there was always a good supply of high-quality types of coking coal (symbol 35-37) so that the coke produced from it had extraordinarily good quality indexes: moisture content 1-3%, ash 10-11%, M 40 75-85), and had the necessary coarse granulation and a shiny silver color. Foundry coke, for example, was often taken manually from the ramp and placed in freight cars. This type of coke was produced principally in the Ostrava coking plants Frantisek, Karolina, and Ignat; the other mine coking plants, particularly in the east of the region, produced mainly heating coke and coke for various industrial purposes because of the variable quality of the coking coal. But even then efforts were made to improve the quality of coke from gas coal, and coking coal was imported for a certain length of time (1901-1902) to the Lazy coking plant. The Trinec and Vitkovice coking plants, of course, produced coke for the requirements of their own blast furnaces.

After the second world war broke out coal mining and coke production in Ostrava and in the lost portion of Teschen were stepped up to the maximum and, since even this output did not satisfy the occupiers demands, particularly for motor fuels (benzol [sic]), new and productive batteries were quickly built. Between 1938 and 1945 a total of 11 batteries with 426 furnaces with an annual output of 2,483,000 tons were built and brought on stream. Two of these batteries were at the newly founded coking plant in Kladno. This increased the capacity of Czechoslovak coking plants in 1945 to around 5,550,000 tons. At that time there were 12 coking plants in operation, of which nine were mine plants (Frantisek, Ignat, Karolina, Trojice, Vaclav, Lazy, Jan, Hohenegger, and the Rosice Coking Plant) and three were metallurgical (Vitkovice, Trinec, Kladno). These coking plants had a total of 1,396 furnaces in 33 batteries. The average annual output per furnace was 3,980 tons.

The output of the Ostrava-Karvinna region and the production of coke reached maximum values during the war years, as can be seen from this comparison with the highest prewar year, 1937:

Table 1

Year	Coal Mined	Total Coke Produced	Of this, in Metallurgical Plants	% of Mined Coal Used to Produce Coke
1937	100	100	30	46
1938	92	75	38	38
1939	113	78	36	32
1940	129	112	41	41
1941	134	111	27	39
1942	144	117	28	38
1943	158	128	26	38
1944	150	135	29	42
1945	66	58	26	41

(continued)

Table 1 (continued)

Year	Coal Mined	Total Coke Produced	Of this, in Metallurgical Plants	% of Mined Coal Used to Produce Coke
1946	87	68	34	37
1947	99	102	36	48
1948	109	135	33	58
1949	104	147	32	66
1950	113	151	32	63
1951	112	150	35	63
1952	126	170	36	63
1953	125	180	42	67
1954	141	188	42	62
1955	146	196	47	58
1956	163	206	46	63
1957	158	209	50	62
1958	167	205	50	57
1959	178	221	55	58
1960	186	239	61	60
1965	231	339	67	68

This crude survey shows clearly that during the war mining rose much more rapidly than did coke production, and the share of coking coal usually did not exceed 40% of the total mined.

In 1944, when maximum production was achieved, the utilization of all capacity of all coking plants totaled only 80%. Of course this was only because five new batteries at four coking plants were brought on stream during the year, with a total capacity exceeding 1,000,000 tons of coke.

In the next year, however, there was a sharp drop in coal mining and thus in coke production. The raids of the American airplanes before the end of the war and the battles of liberation at the beginning of 1945 temporarily hampered coke production in certain plants. The sharp drop in mining, particularly after the flight of the occupiers, had an unfavorable effect on production in all coking plants. Coke production in 1945 dropped to 34% of total capacity.

During 1946 and at the beginning of 1947, when coal was not delivered for coking, the antiquated and inefficient coking plants Vaclav and 1. maj (Hohenegger) were stopped and dismantled. The Rosice Coking Plant, in Zbysova near Brno, although it was put out of operation shortly before the end of the war by military operations, was again brought on stream, because it had its own raw-materials base in the nearby Antonin Mine. This was raw, unwashed powder from 0 to 3 mm in size, containing 2-3% moisture, ash up to 20%, and around 3% sulfur. Operations were continued here until the ash content in the input charge coal rose to the point where the coke ceased to be cohesive and could no longer be pushed mechanically out of the furnace in powder form. The plant stopped operations at the beginning of 1955.

After the nationalization of industry and the formation of the national enterprise Ostrava-Karvinna Coking Plants conditions became favorable for the development and management of the coking plants. These were divided into the fuel and metallurgy sectors, depending on natural local and operational conditions. Six coking plants, with direct connections to neighboring mines and scrubbing plants, were assigned to the administration of the Ministry of Fuels. Three plants were assigned to the Ministry of the Metallurgical Plants; these were closely connected with the blast furnaces of metallurgical combines. The new coking plant at the NHKG became a part of that large metallurgical plant.

As regards the input charge, until the second world war the composition of the charge caused no great difficulty. Each mining society supplied its own coking plants with coal extracted at nearby mines.

The selection of coal types was relatively easy then, because only 30-40% of total coal output was used.

Coal quality often exceeded quality requirements of the finished coke.

After nationalization of the coal industry the Czechoslovak coking plants were faced with the difficult but important task of supplying sufficient quantities of blast-furnace coke for our rapidly developing iron industry, and supplying coal and coke for the developing metallurgical industries of the neighboring people's democracies.

Requirements for coking coal rose, however, more rapidly than did output of the coal district. Thus the proportion of coal used for coke production rose constantly.

This meant a complete transformation of the composition of input charges and a new organization of the supply of coal to scrubbing plants and coking plants. Charges with a large or excessive proportion of deficit coal had to be thinned out in favor of those coking plants which had not yet developed coal mixtures for their own use (Lazy, Cs. armada, Trojice), and also in favor of the rapidly developing metallurgical coking plants. These requirements and changes were not all met at once; they caused a number of difficulties in mining, transportation, and scrubbing of coal and in the preparation of the actual charges.

The difficulties in charge quality were to some extent offset by the fact that mining was concentrated at the more efficient cuts and mines, using the largest proportion of machinery. The large coking quality differences in individual seams and seam groups in the Ostrava-Karvinna region, which were formally evened out by mining from a large number of cuts, now became increasingly acute.

Therefore the present situation in supplies of coking coal is far from satisfactory, since the coke produced in almost all coking plants shows excessive quality variations, which in turn has an unfavorable effect on the operation of blast furnaces.

An improvement in this situation can be expected from the fulfillment of the Third Five-Year Plan, since during this period a number of new scrubbing plants will be activated. This will considerably ease the situation in the coal dressing plants, which are now burdened. It is expected that first there will be a drop in the moisture content of the scrubbed coal by proper drying of fine coal in centrifuges and thermal drying of flotation concentrates. A certain reduction in ash content is also expected, which will also contribute to improving coke quality.

All of these measures, whose realization will require considerable sacrifices on the part of the state, would not be completely effective, however, if unchanging coke hardness and granulation were not also provided. For this purpose the mining and extraction of coal must be organized: coal must be mined selectively in terms of coking qualities, or the coal mixture must be properly homogenized so that in each case the dressing plants will supply the coking plants with coal with known qualities, varying only within permissible limits throughout the day, week, or month.

The present status of the Czechoslovak coking plants, after 15 years of successful operation, is this: at present 10 coking plants are in operation, of which six are mine and four metallurgical plants, with capacities between 180 and 2,880 thousand tons per year. Since 1945 a total of 15 batteries with a capacity of 1,541,000 tons per year have been stopped and dismantled, and 14 new batteries have been erected. Total capacity has risen 49% over 1945, and the theoretical output of the furnaces has reached 5,050,000 tons per year, i.e., 27% more than in 1945.

The total annual value of all coking-plant products is 2.2 billion crowns, which is surely a respectable share of the total national product.

Nonetheless we cannot be satisfied with the overall situation of our coking industry, and there are many tasks which await rapid solution in this area. The success of coking-plant production depends primarily on research into the composition of coal input charges, on perfect and never sufficiently careful design and production of coking-plant equipment (the life-expectancy of new batteries!) and, last but not least, conscientious and proper maintenance of valuable and expensive equipment. The funds expended for these purposes are insignificant compared to the rewards they can bring our economy.

This year is the final year of the Second Five-Year Plan and the beginning of the next Five-Year Plan, which is to mean further expansion for our coking industry. Whereas in 1955 through 1960 coke production will rise by 23%, in the Third Five-Year Plan it is to increase by 44%. This growth will be achieved principally by building new capacity. It is planned to build 11 new batteries with 650 furnaces. At the same time the life of certain old batteries is to be prolonged by making general repairs.

On the timely completion of the proposed expansion of the coking plants depend not only coke production and exports, but also the production of pig iron and steel in Czechoslovakia. Therefore everyone sharing in this expansion must fulfill his tasks in time, and thus contribute to the further development of the national economy and the flowering of our country.

CSO: 4156-D

CZECH EFFORTS FOR THE [DEVELOPMENT OF THE]

GERMAN SUDETEN BORDER AREA

[Following is an unsigned article in the German-language periodical Ost-Mitteleuropea (Eastern Central Europe), Marburg on the Lahn, Vol. 10, No. 3, March 1960, pages 96-100.]

(Report and excerpts from Prace, No. 264, 5 November, 1959, Mlada fronta, No. 284, 2 November 1959, and Aufbau und Frieden [Reconstruction and Peace], No. 147, 10 December 1959.)

Zdenek Skorepa reports on "The Border Region and Its Cultural Development,' in the Czech trade union magazine Prace.

"In order to raise the standard of living of the population of those Kreise (formerly inhabited by Sudeten Germans), important measures were implemented especially since 1953 and primarily in agriculture. Six years ago, almost 90,000 ha [hectares] of soil were lying fallow and several hundred thousand additional hectares were under forced lease or tenancy and were being cultivated inadequately. Today, the entire area is being farmed properly, thanks to socialization. The arable area in the border region was increased more than 26,000 ha; the cattle and hog herds increased in number. The ranks of farmers in the border region were swelled by more than 28,000 new people from the interior of the country; forestry workers were increased by more than 1,300 men; in addition, we have several hundred miscellaneous workers. More than 10,000 one-family homes and apartment units were repaired for the farm settlers. The number of inhabitants in the 58 Bezirke earmarked for settlement increased by a total of 100,000 people.

As people moved into the border regions from the interior of the country, requirements also grew for services, transportation, schools, and culture, health facilities, and social care.

Here is an incomplete list. An additional 100 bus lines were established; railroad transportation was resumed; the rural road system was repaired. The general education schools, including the 11-class schools, were supplemented and all teaching jobs are now occupied. There are about 500 new movie theaters. All health service jobs have been filled and the number of hospital beds and child creches was increased; 16 new old-age homes were built. The retail trade network was expanded by more than 400 stores, of which more than half are selfservice shops. Furthermore, an additional 600 enterprises were set up to serve for community feeding,

as warehouses, and as bakeries. The electrification of the communities is to be completed this year. Several dozen factories with a production area of more than 85,000 sq m have resumed operations. Of special importance is the reopening of the Rothauer iron works near Graslitz, as well as the resumption of production in Grulich, Bezirk Senftenberg, as well as in the Bezirke of Starkenbach, Friedland, Freudenthal, etc.

Despite all these successes, the border region on the whole is still below the level of the Bezirke in the interior of the country. The directives of the Central Committee of the KPC [Czechoslovak Communist Party] and of the government for the Third Five-Year Plan of 1961-65 (Rude Pravo, No. 288, 17 October 1959) devote much attention to the further development of the border Bezirke. The main effort is to be aimed at a higher level of farm production, further development of industry, of home construction, and of maintenance of homes and apartments, improvement of services for the population, and organization of voluntary settlement.

In this connection, the situation in the various Bezirke must be considered carefully so that aid will be given above all to those places which need it most. Twelve Bezirke were selected for the Third Five-Year Plan: Kaplitz, Prachatitz, Winterberg, Tachau, Bischofteinitz, Mies, Asch, Podersam, Theusing, Senftenberg, Datschitz, and Roemerstadt. The main thing to do here is to change the hitherto backward economy through concentrated effort. Toward the end of the Third Five-Year Plan, these districts are to be in a position to develop further by using their own manpower resources without any special aid measure."

Engineer Jiri Prazak, who is on the staff of the newspaper Aufbau und Frieden, and who is a member of the State Planning Commission, stated the following on the economic and demographic development of the border regions.

"From 1947 to 1952 it was necessary to liquidate a number of industrial enterprises in the border area. These were either very small enterprises which were unable to increase their labor productivity and reduce their own operating costs; or it was the shortage of manpower which caused these businesses to close up. But production installations were also closed for no reason whatever in the Erzgebirge Mountains and at Jesenik (see note). ([Note] Jesenik is the Czech place name for Freiwaldau. It seems however that this is a translation error in the German-language Prague publication; instead of "at Jesenik" it should read "im Gesenke" [in the depression], i.e., in northern Moravia and Silesia.) This also led to a migration of industrial workers. In this connection, some of the farmers often migrated into the interior of the country. Although the natural population increase in the border

region of Czechoslovakia was great, emigration in a number of these districts offset this increase. In the meantime, the settlement process in the border regions was essentially stabilized and now the population is gradually increasing. On 1 July 1959, this area was inhabited by 2,629,000 people, that is 69.6% of the population figures in 1939."

The interview with engineer Prazak was continued in Nos. 148 and 155 of 12 and 31 December 1959 and in No. 1 of 5 January 1960. In these articles we reported details on the planned new construction of industrial installations.

Data for the years 1955-1957 on the population growth and development in the three Kreise (see note) of Karlsbad, Aussig, and Reichenberg, which in the past belonged entirely or predominantly to the German settlement area, can be gleaned from publications of the State Statistical Office. ([Note] Kreis (Czech: kraj) is an administrative unit which roughly corresponds to the size of a German administrative Bezirk or a Soviet oblast.) According to these figures, the population in these areas increased primarily due to birth surplus. The gain due to migration was either very small or there was even a loss due to migration.

	1955	1956	1957
Kreis Karlsbad			
Live births	8,036	7,687	7,870
Deaths	2,345	2,321	2,411
Immigration	15,942	13,281	10,930
Emigration	15,909	13,883	12,009
Kreis Aussig			
Live births	12,305	12,245	11,74[illegible]
Deaths	5,830	5,743	6,182
Immigration	14,846	14,362	13,063
Emigration	16,317	13,731	12,018
Kreis Reichenberg			
Live births	8,723	8,319	7,828
Deaths	4,769	4,759	4,820
Immigration	11,797	10,236	9,737
Emigration	12,152	11,597	9,318

(Statisticka rocenka 1957, page 49; Demograficka prirucka 1959, page 32f.)

The lack of domestic feeling of the newly settled population is described in a report by Jiri Taborsky in the magazine of the Youth Organization Mlada fronta. In Eger, a young Czech woman told the author in May 1959: "What do you think? If they would let me, I would leave tomorrow. But I ask you, are they letting any of us leave the border region?"

Then the author in detail describes the measure to be implemented in the border region according to the directives of the Central Committee of the KPC. He then continues as follows.

"Life is not easy there (in Kreis Karlsbad). And that is the plain, honest truth. People there seem to be made of a different, rougher fiber. One can encounter varying customs there; some people keep going there only because of the higher income. They live there, but their ties are with Prague, Pilsen, or Budweis. The families live in the interior of the country and travel to the border regions only to work. Monday morning they get on the bus or train, during the week they live in billets and, unless they have to do overtime work on Saturday, they hurry home again on Friday night. These are technicians, engineers, miners, workers and teachers. Most of them like to work there. They know that they would leave a gap in the shop or office, if they were to depart. But they do not want to live in the Bezirk of Kauden, Falkenau, or Tenusing. That really does not appeal to them. They do not want to strike roots there. Today the young men still come from afar, as far as Slovakia in order to make their living there. They work hard for a whole year. But then they pack up and go back to their own villages. They just take off, but they always come back, as though there was something there to attract them to this Kreis."

Most people allegedly do not work it this way. They do not desert. "People here are a special breed. They complain, curse, and criticize here more than anywhere else, but they stay. Only the weak ones take off - the rest of the golddiggers, those who came here or were transferred here for some misdemeanor in the past."

Sergej Machonin, in his report "Stars above the Hot Land" in the literary journal Literarni noviny (No. 41, 10 October 1959), describes the rootlessness of many people in the Egerland area in a very similar manner.

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FIFTEEN YEARS OF MACHINE TOOL DEVELOPMENT IN CZECHOSLOVAKIA

[Following is a translation of an article by K. Schebesta of the Research Institute of Machine Tools and Metal Working (Vyzkumny ustav obrabecich stroju a obrabeni) in Prague, in Strojirenska Vyroba (Engineering Production), Vol 8, No. 5, Prague, pages 202-210 May 1960.]

The production of machine tools in Czechoslovakia has an old and good tradition. It was primarily the Skoda Works in Plzen which were producing various types of machine tools even before World War I, mostly for their own needs. Several of the smaller manufacturers also had a production program for basic machine tools, such as simple lathes, drills, milling machines, and presses, all of them operated by belt drive (transmisni pohon) and which were also exported.

Following the liberation of Czechoslovakia by the Red Army [at the end of World War II] and the nationalization of all major enterprises producing machine tools, the first large and specialized national enterprise, the United Machine Tool Works (Spojene tovarny na obrabeci stroje) was created and amalgamated all of the larger Czechoslovak enterprises which were producing machine tools with the exception of this type of production at the Skoda Works in Plzen and in Smichov [district of Prague], the engineering works of the Bata enterprise in Zlin and in Sezimovo Usti, and at the Bohemian Arsenal (Ceska Zbrojovka) in Strakonice. Workers and technicians rapidly eliminated the damage caused by war and embarked, with verve, upon a better-organized production program in accordance with socialist principles. Former international commercial contacts were rapidly re-established, primarily with the USSR and, as early as 1945, the first deliveries of machine tools to that country were made.

An important task during the period of preparation for the First Two-Year Plan was the organization of technical development in this branch of industry and the rapid preparation of production programs for individual enterprises, some of which did not have their own designing offices. It was necessary to create order in the chaotic status of assortments of machine tools, left as a legacy of the capitalist war economy, since many enterprises were actually competing with each other in regard to types and sizes of machines they were producing.

At that time, for example, center lathes of similar execution were being produced in ten different factories; milling machines in 5; and drill presses in 7. This situation was further complicated by the fact that, in addition to the nationalized enterprises, there existed a number of smaller and very small private manufacturers of machine tools, whose production programs could not, however, be sufficiently influenced.

It was necessary to consider the value of designs for individual types of machine tools for which drawings were available and to set up production programs which would, on the one hand, correspond to market possibilities and existing market requirements, both in Czechoslovakia and abroad, and on the other hand, be of a technical level which might correspond to world competition.

The technical level of many types of machine tools was inadequate and, in the case of many machines, there was duplication in production. Therefore, it became necessary to eliminate selected types of machines and to rapidly prepare design specifications for other types which had not previously been produced.

Simultaneously, production programs of producers of SKODA, MAS, and CZ-brand machines were coordinated in order to eliminate duplication in development and production; this move was successful to a considerable degree.

In reorganizing the production program within the framework of the enterprise "Spojene tovarny obrabecich stroju", 69 of the existing types of machines were eliminated and 56 machines were newly designed. At the beginning of the Two-Year Plan, the enterprise had 298 standardized dimensions for machine tools, including presses. Through specialization of production, this number declined to 280 by the end of the Two-Year Plan. However, this latter figure includes newly-designed machines, of which 22 were completely new and had thus far not been produced in Czechoslovakia. In addition, 78 types of special unit type machines (stavebnicovy stroj) were developed.

The Skoda Works in Plzen concentrated correctly, from the start, on heavy machine tools and introduced heavy-duty center lathes (S 1,000 through S 2,500) onto the market; furthermore, the plant produced various special purpose lathes, the first vertical lathes to be produced in Czechoslovakia (K 1,250 and K 2,500), and the HVF 160 horizontal boring mills, which were considered modern at that time and boasted continuous remote control of the spindle.

The Ceskoslovenska Zbrojovka, national enterprise, of Strakonice concentrated primarily on the production of universal grinding machines and semi-automatic aperture grinding machines and initiated production of the modern BDA 20 and BDA 40 models.

In addition, the enterprise was developing the Model FN 22 toolmaker's milling machine and a number of other machines for the manufacture of motorcycles and chains. The engineering works of the Bata, national enterprises, were preparing the Model FK 08 three-dimensional duplicating milling machines, which is still being manufactured today but whose series production was not begun until the initial years of the Five-Year Plan.

At that time, during the period of renovation of industrial production, and because of the unstabilized character of their production programs, the requirements of domestic investors were primarily concentrating on universal machine tools of medium size. However, the requirements of the world market exerted a considerable influence on the composition of the program for the production of machine tools and the direction of development, because the export of machine tools accounted to roughly 50 percent of all production during these early post-war years.

By the end of the Two-Year Plan, a number of good designs of machine tools had been developed. We like to cite the popular Model SV 18R lathe, which is still being produced; the high-capacity arbor milling machines of the FA2 - FA5 series; the large gear milling machines of the FO 25 and FO 10 series; the new, progressive, and highly efficient HD 12, 16, and 20 planning machines; the larger types of vertical lathes of the St 450 through St 630 series; the new V 10 through V 32 drill presses; the sharpener for lathe cutting tools, Model BBT 350; the grinding machine for twist drills, Model BNV 75; the modern Model H 63, 80, and 100 horizontal boring mills, and many other types of machines for export. In addition, 42 models of unit type machines were delivered for the production of parts for Czechoslovak motorcycles; 11 types for production of the principles components of tractors, and another 25 types for the production of industrial consumer goods, fittings, typewriters, pneumatic hammers, agricultural and other machines.

These highly-efficient machine tools contributed to raising the efficiency of our enterprises and improving the quality of their products.

Figures 1 through 7 show typical machine tools from the assortment in production during the period following the end of World War II; figures 8 through 15 show some of the new types of machines developed by the end of the Two-Year Plan.

During this period of renovation and reconstruction of the industrial base of Czechoslovakia, the production of several simple machine tools was introduced in Slovakia; they included columnar and other drill presses, two-wheel grinding machines, etc.

Following the nationalization of the remainder of the industry in February 1948, it was also possible to adjust the production programs of small manufacturers more effectively, in accordance with the requirements of the Czechoslovak national economy and to utilize their productive capacities for the production of key machines. Thus, for example, the Stredokluky Enterprise was oriented toward the production of Model BN 102 universal grinding machines; the Ctyrkoly Plant toward production of Model BPH 20 surface grinding machines; and the Moravany Enterprise toward the production of centerless grinding machines. In place of inefficient production of obsolete center lathes and arbor milling machines, valuable capacity was thus gained for the expansion of the production of the types of grinding machines which were in great demand.

Through this re-designed production program, the industry fulfilled not only the demands of the domestic engineering industry but also gained full recognition in the world market and, in addition to the traditional markets, obtained a number of new ones, for example, in India.

The First Five-Year Plan

Development during the First Five-Year Plan was characterized by the transition toward the production of heavy machine tools as a result of deepening commercial relations between Czechoslovakia and the USSR, as well as the other socialist countries. These machines were needed for the heavy industries, particularly for heavy engineering, in all socialist countries. Virtually the total Czechoslovak developmental capacity was devoted to the rapid development of heavy machine tools, some of which had to be developed for domestic purposes, since without them it would have been impossible to fulfill the great assignments of the plan in the production of very heavy machines for the important heavy industry. A second principle direction taken by developmental work in machine tools during this period was work on machines with greater degrees of mechanization, that is to say, semi-automatic and fully automatic machines. Simultaneously, it was necessary to increase the durability, accuracy, and efficiency of machine tools. To assure a higher technical level in the industry, it was necessary to solve questions of basic research and to become adequately familiar with our own experiences. Therefore, in 1949, an independent developmental enterprise was created which now forms the core of the present Research Institute for Machine Tools and Metal Working (Vyzkumny ustav obrabecich stroju a obrabeni) [VUOSO] in Prague.

The designers of the Sukoda Works in Plzen augmented the ranks of heavy-duty machine tools by adding the Model SK 40 and SK 50 vertical lathes, capable of handling work measuring up to 4,000 and 5,000 millimeters, respectively. They also contributed two types of horizontal boring mills, Model HVF 125 and HVF 200, with spindle diameters of 125 and 200 millimeters, respectively; the Model FRU 63 universal surface milling machine; three types of planers for edges of sheet metal, Model HHP; and the heaviest machine thus far produced in Czechoslovakia, the giant universal center lathe, Model SR 3150, which is 30 meters long and measures 3,150 millimeters across the chuck face. In addition, other enterprises, which had thus far not been producing machine tools of a heavy caliber, were developing heavy-duty machines, such as the Model FP 12, 16 and 20 portal milling machine; the Model FK 08a, b and c duplicating milling machine; the Model FO16 gear milling machine, capable of cutting gears of up to 2,000 millimeters in diameter; heavy-duty grinding machines for cylinders, Model BEV 31 and BEV 63; the Model BTV 63 grinding machine with revolving table; the Model PVU 10 heavy-duty vertical hydraulic broach, and special heavy-duty milling machines for machining very heavy work weighing over 100 tons.

Thus, during the First Five-Year Plan, production of 20 new types of heavy and very heavy machine tools and 30 new types of medium-size machines was begun. The latter included, for example, the five-spindle automatic machines for processing bar stock and blanks; highly-efficient center lathes; additional sizes of milling machines; gear shapers, and various types of grinding and sharpening machines. In addition, a number of special purpose machines, primarily grinding machines, for roller bearing production, for production of diesel engines, tractors and sewing and textile machines, were being developed and manufactured; this development also included a considerable number of machines for mass production and large scale series production of consumer goods. (Figures 16 through 23 show some typical machines from the period of the First Five-Year Plan). Also, heavy machine tools were being produced for the USSR, based on Soviet documentation.

A significant event of the First Five-Year Plan was the transfer of the predominant number of the former engineering enterprises of the Bata concern in Zlin and of the MAS Enterprise in Sezimovo Usti, into the federation of enterprises producing machine tools as independent entities. Only this move facilitated a more effective specialization in the development and manufacture of machine tools within the framework of the now independently organized basic establishments. In order to raise the capacity for the production of heavy machine tools in Czechoslovakia to

assure the key development of heavy engineering in all socialist countries, it was possible to relieve the Skoda Works in Plzen from having to produce any light and medium machine tools and to assign the production and further development of these machines to specialized establishments. Thus, for example, the new Precision Engineering Works (Zavody presneho strojirenstvi) in Gottwaldov was assigned to specialize in the production of all types of turret lathes; semi-automatic turret lathes; multiple-spindle automatic machine tools for handling bar stock and blanks; and single-spindle automatic machines (dlouhotocny -- long-time-revolving, or longitudinal revolution) newly-introduced in Czechoslovakia.

A definite landmark in the history of the development of machine tools in Czechoslovakia is also the successful introduction of the production of more exacting and more complicated machine tools in greater numbers in Slovakia, where the production of well-known universal center lathes of the Skoda SUR series in all sizes was mastered.

If we compare the characteristics of the machine tools developed during the First Five-Year Plan with former types, we find that, apart from a substantial increase in efficiency attained through increasing the capacities of motors, the range of revolutions and feeds, increasing the strength of the machines, etc., the designers of all machines exerted efforts to improve the controlability of their machines through mechanized handling. Machines were equipped with remote controls using electric pushbuttons, mechanical rapid-action devices for changing settings, control was better concentrated, lubrication was automatic and the first machines with simple automatic work cycles began to make their appearances (SPE 50, BUA 31), permitting one operator to handle several machines simultaneously.

The Second Five-Year Plan

The principle directions of technical development of machine tools during the Second Five-Year Plan were the attainment of greater accuracy and reliability of machines and an increase in the degree of their automatization. During this period, world development was already deviating from the line of increased utilization of single-purpose and unit-type machines with automatic work cycles, which are found to be economical only in large-scale series production or mass production. Efforts in Czechoslovakia were concentrated, therefore, primarily on the automatization of more universally-usable machines for conditions of our predominantly medium and small-scale series production. However, progress was

also made in solving various highly-productive auxiliary installations for universal machine tools, whose utilization resulted not only in substantial increases in productivity for a given machine up to 200 percent but also in increasing the degree of its mechanization and automatization, thus facilitating the operation of several machines by one worker; where productivity of labor was computed in terms of individual worker, this step also raised that productivity. For example, this equipment included auxiliary hydraulic duplicating devices for Model IKS center lathes, as well as for other metal-cutting machines; continuous measuring devices for checking the size of work during actual machining and for directing the work cycle of grinding machines; devices for mechanized inserting and holding of work in machine tools, and a number of other so-called devices of minor mechanization.

However, the modernization of the then-existing machine tool stocks was not neglected and, simultaneously with the solving of auxiliary equipment for machine tools, documentation was worked out for the modernization of tens of older Czechoslovak machine types.

During the Second Five-Year Plan, agreements were also made regarding the effective division of labor in the development and production of machine tools on an international scale between several socialist countries; international specialization in this industry was thus begun. Czechoslovakia was faced with very demanding tasks.

The main emphasis in developmental tasks during the Second Five-Year Plan was the introduction of new, highly-efficient, and progressive machines with greater degrees of automatization and mechanization, having a deciding significance in the assurance of the growth of productivity, not only in Czechoslovakia, but also in the other socialist industrial countries. These machines with automatic work cycles became the core of Czechoslovak exports to the USSR and to the other socialist countries. They were primarily the new semi-automatic duplicating lathes, Model SP 31, SP 25 and SPK 63, whose progressive design aroused rightful attention at all exhibitions (they took top prize at the 1958 World Fair in Brussels); the new center grinders, Model BUA, operating automatically by hydraulic control; the new and highly-efficient milling machines of the FB series, with automatic work cycle controlled by stylus or even by digital means, with the assistance of a perforated tape; the new semi-automatic and fully automatic aperture grinding machines, Model BDA, with electrically-hydraulic automatic work cycle (Gold Medal at the 1958 Brussels Fair); the new revolving boring mills with programmed control of pre-selected revolution numbers for the working spindle, feeds, and boring depths;

the new series of horizontal boring mills, Models WH 63, 80, and 100, with automatic setting of selected jigs and remote optical control for selecting the position of the work surface; the new surface milling machines of the FR series with an automatic work cycle which can also be equipped with duplicating mechanisms; vertical lathes with program control, and a number of other, similarly automated machines.

The automatization of heavy and very heavy machine tools was solved extremely effectively. These machines serve almost exclusively for individual production of various types of large items, where automatization of the work cycle would not be appropriate. Therefore, all new heavy machines are equipped with devices for the automatization and mechanization of operation, that is to say, they have remote controls for all operations from the operator's stand; automatic tightening of all movable parts which do not happen to be in operation at a given moment; remote control measuring of the setting of tool posts or cutting tools; concentration of all control elements in one central control panel, etc. Since the end of the First Five-Year Plan, new types of heavy-duty horizontal boring mills, Model WD 160, WD 200, and WD 250 and the modified Model WP have been newly designed. Another giant vertical lathe, Model SK 125, capable of handling work measuring up to 12,500 millimeters in diameter, was designed and produced. Further, an entire new series of heavy center lathes of the SR series was developed, capable of handling work measuring 1,000, 1,250, 1,600, 2,000, and 2,500 millimeters, as well as the heavy-duty vertical milling machine, Model FV 1,000 and a number of other special heavy machine tools.

Simultaneously, by the end of the First Five-Year Plan, production of various types of automatic single- and multiple-spindle machine tools was expanded considerably; designs were completed for a series of precision, slow-revolution automatic machines of the AD series in five sizes; single-spindle automatic machines, Model AB 63 and AB 80; additional size ranges of horizontal and vertical AN, ANK AND AMK automatic machines having five and six spindles; semiautomatic RB 63 turret lathes; a new RC series of turret lathes which can, according to need, be equipped with varying degrees of automation until they can be used as fully automatic machines. During this period, the production programs for machine tools were almost completely renovated. Designs were solved for new types of universal center lathes in all sizes; new types of center grinders and surface grinders; a highly-efficient gear milling machine, Model OFP 20, having a programming device and magazine feed (zasobnikove zarizeni); a number of sharpening machines for cutting tools, as well as other machine tools for special purposes. Neither were simple, but modern machine tools for special purposes for Czechoslovak export commitments neglected.

Another important direction of emphasis in technical development during the Second Five-Year Plan were the special unit-type machine tools and automated production lines. In order to successfully master the development and production of these machines in the required scope, it was primarily necessary to increase standardization of their groups and parts. Currently, work is in progress on a proposal for specializing production of these standardized elements and international specialization in their further development and possibly their production is being prepared. In addition to the large number of unit-type machines which have been delivered in every year of the Second Five-Year Plan thus far, the first automatic production lines of Czechoslovak design and manufacture are putting in their appearances in Czechoslovak automobile factories and other enterprises.

Figures 24 through 33 show some of the typical representative machines of the period of the Second Five-Year Plan.

Particular successes of the industry during the Second Five-Year Plan are the solution and adoption of the production of several machine tools of extreme precision and the solution of the problem of standardization of various types of standardized automatic programming control devices for machine tools based on the analog or digital systems.

Some of these are the first Czechoslovak hydro-optical jig-boring mill, Model WKV 100; correction and control devices for the production of extremely low-tolerance gear wheels, working on the principle of a circular magnetic measuring device; extremely accurate lathes for tool and die shops and laboratories for precision machines, Model SU 32 and SD 32; the special-purpose highly accurate Model BE 7 grinding machine for simultaneous grinding of surfaces, holes, and faces (for example, for grinding ball races for precision roller bearings); the new micro-level; a number of precision spindles for grinding of apertures, Model IBA, etc.

Future Outlook

The main directions of technical development for machine tools in the Third Five-Year Plan are wholly within the sphere of additional automation, greater accuracy, and greater reliability of new machines. All newly-developed machines are to be suitable for use in production lines of varying degrees of automation. The share of semi-automatic and fully automatic machine tools in the overall number of machines produced will grow from year to year; a considerable number of these machine tools will be installed in

automatized production lines. Similarly, the number of special unit-type machines will also continue to grow. These great tasks will only be assured through maximum possible standardization of groups and parts.

Research work and practical experience confirm that even machines used for the repeat production of individual pieces of work, or in small-scale series production, can be automated with good economic results. Savings and increased productivity can be attained with these machines by making it possible for one operator to handle several of them; down time is then reduced to the minimum; scrap production is virtually eliminated and utilization is regularized because it does not depend on the varying efficiency of different operators. Because this type of production prevails under conditions in Czechoslovakia, special attention will be devoted to the effective solution of the automation of machine tools used in the production of individual pieces of work or in small-scale series production. The method of automatization will have to be solved in such a manner that setting up the machine for another piece of work does not consume inordinate amounts of time and that the time required to re-set is not greater than that required for existing universal, hand-operated machines. Toward this end, it will be necessary, among other items, for the cutting tools for any given piece of work to be assembled, (away from the machine), to conform to the exact tolerances of the job at hand.

During the next Five-Year Plan, Czechoslovak engineering enterprises are scheduled to receive such quick-set automatic machines for the majority of metal-cutting operations. Their detailed listing exceeds the scope of this article. Their detailed descriptions will gradually be made public in the periodical Strojirenska Vyroba.

This modern concept in automation is sometimes also referred to as "flexible automation" -- because the degree of automation used can be adapted to any given requirement of the technology of production selected and the time required to set up the machine for other production is a fraction of the time required by the classical automatic and semi-automatic machines.

Recently, designs have appeared, and standards have been written, for suitable unit-type elements for individual systems and various degrees of this type of automation; it will be possible to apply them to various types of machine tools. In the next few years, additional types of automated center lathes will gradually be manufactured; their work cycles will gradually be manufactured; their work cycles will be controlled by the stylus method, together with a duplicating template. Further, there will be semi-automatic machines for tool and die makers, having tool posts capable of

holding several cutting tools and controlled by perforated punch-card and stylus, or perhaps by a combination of the above plus duplicating template; or by perforated tape and template. Designs for suitable systems to be used in turret lathes and single-spindle automatic machines with several cutting tools have also been solved. According to their intended utilization, these machines will be equipped with varying degrees of automatization, as follows:

a. Simple program control, using contact stylus and feeler devices;

b. Program control through perforated tape and feeler devices with two-directional duplication according to a template;

c. Digital program control through a perforated tape for rectangular shapes and two-directional duplication according to a template.

The method of control outlined in (c) above will be standard equipment for the new SKJ 8 and SKJ 10 single-column vertical lathes.

It will also be possible to equip the following machines with the program controls indicated:

1. Revolving drills -- digital control and jig table for automatic accurate setting of jigs;

2. Horizontal boring mills -- digital control through perforated tape for automatic changes of revolutions and feeds, as well as changing the position of the tools;

3. Milling machines (surface and universal) --

   a. Control through perforated tape and stylus;

   b. Digital control through perforated tape;

   c. Digital control through perforated tape, via an interpolator and tape recorder (for complex shapes);

   d. Automatic control when duplicating shapes through magnetic tape (based on the system: record - play back);

4. Center grinders -- automatic work cycle, controlled by stylus and measuring device; for grinding of internal surfaces; possibly even a device for duplicating the shape of the grinding wheel;

5. Aperture grinding machines -- automatic work cycles controlled by stylus and measuring device.

The above are only the main methods of application of presently-known methods of program control of machine tools. Possibilities of flexible program control of universal automatic production lines will be examined.

In order to abbreviate required developmental periods, and to reduce the costs of production of the new machines, progressively more use will be made of the unit system of designing entire units, even in designing new universal machines.

Enterprises manufacturing heavy machines and equipment, as well as metallurgical enterprises, will receive a number of heavy, highly-efficient machine tools during the next five-year plan with adequate remote controls, which will eliminate all physical strain and will make their operation almost completely automatic.

These will be new, heavy lathes of the SIU series for work measuring from 1,000 to 4,000 millimeters in diameter; various types of special lathes, particularly those for roughing rectangular and cylindrical steel ingots; heavy-duty vertical lathes and protal machine tools for shaping, milling, planing, and grinding of the heaviest types of work, etc.

Conclusion

Czechoslovak production of machine tools offers engineering customers at home and abroad a wide assortment of progressive production machines. Through the application of domestic and international division of labor and specialization of production, together with the standardization of designs, the number of types of machine tools produced, many of which have thus far had to be imported, from capitalist countries, will be further increased. Even though Czechoslovak production does not include all types of machines, together with that of the USSR and the GDR (German Democratic Republic) and the other People's Democracies, it presents a sufficient selection to satisfy even the most exacting production.

The planned and concentrated direction of the production of this entire industry, the effective arrangement of production programs between friendly nations, the coordination of research with development and production, the establishment of contacts and exchange of experiences with the most important foreign research institutes and, last but not least, the stabilization of sales through long-term plans for the development of the economies of the countries of the socialist camp, headed by the USSR, assure Czechoslovak machine tool production a firm and common line of future development aimed at the principle goal -- catching up with, and surpassing, the world technical level in this industry.

FIGURE CAPTIONS

Figure 1. Universal center lathe, MAS SN 200

Figure 2. Automatic turret lathe -- Skoda A 20

Figure 3. Revolving boring mill -- MAS VR 4

Figure 4. Universal milling machine -- Zbrojovka F2U

Figure 5. Universal center grinding machine -- Kamenicek 1U

Figure 6. Surface grinding machine -- Podhajsky BPH 300

Figure 7. Double housing planer -- Hopfengaertner H 85

Figure 8. Universal center lathe -- Volman S 30

Figure 9. Turret lathe -- Skoda R 36 (compressed air chuck and feed for bar stock)

Figure 10. Horizontal boring mill -- TOS Varnsdorf H 80

Figure 11. Horizontal universal milling machine -- TOS Kurim FA4H

Figure 12. Double housing planer -- TOS Holoubkov 12.5

Figure 13. Gear milling machine -- TOS Celakovice FO 25

Figure 14. Gear shaper -- TOS Celakovice OH 4

Figure 15. Semi-automatic four-sided unit-type machine -- TOS Kurim

Figure 16. Multiple-cutter semi-automatic chucking machine -- MAS SPE 50

Figure 17. Five-spindle automatic lathe -- TOS AN 35

Figure 18. Vertical lathe -- TOS SK 12 (with remote control and constant regulation of revolutions)

Figure 19. Heavy-duty horizontal boring mill -- Skoda HVF 200

Figure 20. Portal surface milling machine -- TOS FP 16 (with four milling heads and remote control)

Figure 21. Semi-automatic duplicating milling machine -- FKO 8c (for spatial duplicating [three-dimensional?] with electric control)

Figure 22. Semi-automatic universal center grinding machine -- TOS Hostivar BUA 31

Figure 23. Planing machine for sheet metal edges -- HHP 6

Figure 24. Semi-automatic duplicating lathe -- MAS SP 25 (with two duplicating supports and program control)

Figure 25. Semi-automatic turret lathe -- TOS RB 63

Figure 26. Single-spindle automatic turret lathe -- MAS A40A

Figure 27. Single-spindle automatic machine -- MAS AB 80

Figure 28. Horizontal boring mill -- TOS WH 63

Figure 29. Vertical bench milling machine -- TOS FVS 16 (with automatic work cycle and hydraulic duplicating equipment)

Figure 30. Surface milling machine -- TOS FR 08 (with program control)

Figure 31. Semi-automatic universal grinding machine -- TOS BUA 20

Figure 32. Semi-automatic aperture grinding machine -- TOS BDA 63 (with electro-hydraulic control of the work cycle)

Figure 33. Automatic production line for the machining of railroad car bearing boxes.

CSO: 3694-D

I. THE ECONOMIC EFFECTIVENESS OF CULTIVATING THE BASIC VARIETIES OF FORAGE CROPS

[Following is a translation of an article taken from the Czechoslovak periodical Zemedelska ekonomika (Agricultural Economics), Prague, Vol. 6 (XXXIII), No. 1, January 1960. Authors and inclusive page numbers are given below.]

Pages 1-28

Karel Cizek

Introduction

The effective effectiveness of growing individual varieties of forage crops is computed and examined in this study primarily on the basis of the results which the Research Institute of Agricultural Economics of the Czechoslovak Academy of Agricultural Sciences obtained for the years 1957 and 1958. In 1957, 10 state farms (which included all four production areas) were inspected and their forage crops studied. Besides the forage crops grown in state farms not represented among the selected state farms were also examined, particularly if they were of special importance. The 1958 data, which were used to provide additional material and make the results more accurate, concern chiefly forage plants and were collected in 15 different state farms.

Since the purpose of this study is to make general conclusions on the basis of the fundamental criteria of the economic evaluation of fodder valid for wide categories of practical cases, and this study concerns all types of the basic forage crops, the representativeness of the ascertained results was verified, while processing the material and evaluating it, by comparing the basic established indices with the state-wide figures (covering several years), insofar as the latter were available from the agencies which had prepared them. This study, then, should provide assistance in this matter.

The State of the Fodder Base

In order to throw light on the general situation regarding the fodder base, the main indices were compiled from 10 sections of state farms for the year 1957. This concerns sections where the economic effectiveness of growing various kinds of forage crops was examined. The average acreage of these sections was 748 hectares of arable land and 985 hectares of pasture land. For each 100 hectares of pasture land there were 42.5 head of farm animals.

The results of the efforts to stock up on locally-grown forage have not been satisfactory. The locally-grown forage crops containing digestible protein nutrients lasted for only 273 days (74.5%) -- those containing starch, for 303 days -- of the calendar year. The supplement consisted primarily of purchased grain feed.

Out of the total forage nutrients in feed (which the farms have either grown or purchased), the forage plants on tillable land have supplied, on the average in the 10 examined sections, the largest share (including ensilaged fodders): 31.1% of starch units and 37.6% of digestible proteins. The corresponding figures for pasture hay and grass were 15.2% and 14.2%, and for grain of local production, 13.1% and 9.6%. These quantities of course vary in different areas. Thus, for example, in the mountain production area, pasture hay and grass have supplied 63.3% of starch units and 61.3% of proteins; the forage plants on tilled soil provided 11.0% and 13.6%; and grain, only 2.5% and 1.9%. In sections where corn and beets are grown, forage plants on tilled land provided 37.2% of starch units and 43.8% of digestible proteins; beet tops and beet roots provided 11.2% and 10.7%; grain contributed 15.6% and 11%; and the total share of meadows (hay, grass, and pastures) was only 1.6% and 1.5%.

An average of 28.6 quintals of forage were silaged per head of horses, cattle, and sheep, which represents only one half of the quantity which the "Measures for Strengthening and Further Expanding the State Farms have stipulated for the beet area, viz., a minimum of 60 quintals, and for other areas 40 quintals, of silage per head of livestock. The shortage is the result of the failure to fulfill the planned yields per hectare, an insufficient amount of adequate silage crops, and in certain enterprises, the conservative thinking on the part of the workers on how to use the silage and to what extent.

Coarse fodders of local production (including straw) provided, of the total quantity of consumed nutrients (either locally-grown or supplemented by purchase), 61.2% of proteins and 66.7% of

starch units; grain fodder, 13.3% of proteins and 16.6% of starch units. This makes it clear that coarse fodders are by far the strength of the fodder base.

Economic Evaluation of Individual Varieties of Forage Crops

In selecting individual kinds of forage crops and in determining the extent of their cultivation, a large number of factors must be considered, such as: securing the continuity of the green forage supply, maintaining permanent sowing techniques, planning work for the whole year, the rotation of fodders, etc. The main indexes which serve to indicate best the economic effectiveness of growing particular types of forage plants are the production of nutrients per hectare, the costs of the produced nutrients per unit, and the achieved labor productivity.

In evaluating the production of fodders by the various farms, the starch (oats) units produced per hectare are used as an index of the nutrient content, the quantity of digestible proteins also being taken in account. The productive capacity of individual kinds of forage crops was calculated on the basis of their yields per hectare and their average nutrient content.

Similarly, the financial evaluation is usually made by computing the costs per starch unit. This of course is correct only in cases where we compare several types of crops having an approximately equal content of proteins against the total quantity of starch units per quintal, or when a sufficient quantity of proteins is provided by other fodders and it is a question of producing the highest quantity of the cheapest starch units.

Since there is shortage of proteins, they are usually more expensive than nonprotein nutrients and are thus equated with starch units of a 0.94 coefficient, while starch and nonnitrogenous extracts are equated with a 1.0 coefficient. It is necessary that fodders with a higher content of proteins be evaluated in higher terms as compared with those having a lower content of proteins, even if they contain an equal amount of starch units.

The new index called "higher starch unit" [see Note] has been established for purposes of the financial evaluation of fodders. It is more suitable also in computing the achieved labor productivity. In essence, it is a starch unit in which digestible proteins are evaluated by multiplying them by 1.5. This multiplier (coefficient), determined on the basis of the ratio between the price of 1 kg of protein and the price of 1 kg of other nutrients of nonprotein origin, is used to represent the group of fodders

with a predominant content of carbohydrates and, partly, the group of protein fodders. On the basis of the coefficient of digestible proteins thus established, the starch units of all the examined crops were computed, and the direct and production costs were calculated not only per starch unit but also in terms of the new index -- per higher starch unit. (Note: A detailed study of this question is published in No. 2 of the publication of the Czechoslovak Academy of Agricultural Sciences -- Zemedelska ekonomika, 1959, in the author's contribution "An Economic Appraisal of Farm Fodders.")

The labor productivity achieved in growing individual types of forage plants was mainly expressed in the quantity of starch units produced per 100 hours of manual labor and per 100 Kcs in wages.

Because even the final by-products of forage crops are almost exclusively used for feeding, the calculations of some main indexes are decisive in the estimation of the economic effectiveness (cost per unit of nutrients) of the level of labor productivity, etc., and they are based on the quantity of nutrients contained in the by-products. This concerns not only beet tops and beet roots, but also the straw of spring crops and legumes which are used predominantly for feed, and the corn stalks which can be successfully ensilaged.

In determining direct and production costs, individual components were calculated as follows: the costs of manual labor according to wages actually paid; seed, fertilizers, and various forage materials according to the quantity sown and the market prices, where purchased goods were involved, or the costs of local production. Where clover is concerned, the seed costs have diminished over the period in which this crop was cultivated on individual farms. Barnyard manure was calculated at a cost of 5 Kcs, and its value, together with the costs of labor in manure spreading, was calculated per individual crops according to the areas where it was used as follows: in the first area 50.%, in the second area 25%, in the third 13%, in the fourth 8%, and in the fifth 4%. When crops were not directly treated with barnyard manure in the year in question, the proportion of expenses for manuring, manual labor, and animal and machine-tractor work was determined on the basis of costs per quintal of manure along with other manured crops of the same farm. The cost of manure was charged to the crop account of the area manured and was distributed over the period beginning with the year when the fields were last manured. This means, therefore, that all crops on arable land (except clover) carried the proportion of costs connected with manuring and the cost of bornyard manure, even though some fields had not

been manured during the year in question. This distribution of costs for manuring the fields corresponds essentially to its effect on the land in individual years.

The cost of liquid manure and the labor connected with spraying it in the fields was included as part of the crop cost for the production of which the liquid manure was directly used.

One quintal of forage straw was estimated at 16 Kcs; bedding straw at 13 Kcs; and beet tops at 6 Kcs.

The figures showing the economic effectiveness of growing various types of forage crops were calculated in each enterprise on the basis of 100 feed units and 100 hours of man-labor per hectare, etc.; the average was then computed. In the case of crops which had been worked on for 2 years for research purposes, the average was computed from the materials gathered during these 2 years and the method employed was that of the arithmetic mean.

The economic evaluation of forage crops is divided into four categories: grain crops, root crops, forage crops, and a summary evaluation in which the main figures of all the tested forage crops are compared. In conclusion, the most important measures for increasing the economic effectiveness of growing forage crops are proposed.

Grain Crops

Grain crops are classified among cereal fodders, since proportionately to their volume they contain a large quantity of nutrients. For certain types of farm animals (especially when fattening hogs, cattle, and poultry) cereals comprise a substantial component of the feed ration; for other farm animals (breeding stock and animals of higher utility) cereals are a necessary supplement. In general, cereals are a concentrated means of attaining the most adequate nutrient content in fodder rations which is balanced with the requirements of rationed feeding. Because forage straw is today usually considered as another basic feed, its nutrients were evaluated in some indexes together with the nutrients of the main products.

In calculating the main indexes of the economic effectiveness of growing the various types of grain indicated below, the following average nutrient contents were used:

	Proteins	Starch units	Increased starch units
Spring barley:			
grain	6.5	69.0	78.8
straw	0.6	17.5	18.4
Oats:			
grain	7.0	60.0	70.5
straw	0.8	17.0	18.2
Corn:			
grain	7.0	80.0	90.5
straw	1.0	18.0	19.5
Winter legume mixture:			
grain	13.0	70.0	89.5
straw	1.6	13.3	15.7
Spring legume mixture:			
grain	13.0	70.0	89.5
straw	1.8	18.0	20.7

On the basis of yields attained per hectare of grain and straw, based on the average nutrient content, the productive capacity of various types of cereals was calculated as follows:

I. PRODUCTIVE CAPACITY OF CEREALS (AVERAGE OF THE EXAMINED ENTERPRISES)

Indexes	Barley: all enterprises	Barley: thereof: in corn and beet growing areas	Oats	Corn	Legume (mixtures)
Yield per hectare:					
a) grain	22.61	30.48	17.81	28.02	12.28
b) straw	26.11	35.66	21.31	63.54	18.28
Production of nutrients per hectare:					
a) proteins	163	220	142	260	214
b) starch units	2017	2727	1431	3386	1185
c) increased starch units	2262	3058	1644	3775	1506

The highest productivity per hectare was observed in seed corn. It is higher by far than all other types of cereals, and higher than the barley grown under similar soil conditions, i.e., in the corn - and beet - growing areas. This is due mainly to the greater content of nutrients in the cereal and partly in the straw. Besides corn also gives a substantially larger quantity of straw per hectare.

The productive capacity of corn is further relatively increased if we consider the various quantities of seed sown per hectare, which in the case of corn amounted to approximately 1/4 of the quantity of other grain crops.

The lowest quantity of starch units was gained from legumes. In proteins, however, their production was next highest to corn. Yet it is necessary to state that the yield of legumes per hectare in the research year was relatively unsatisfactory in comparison with the yields of other crops. Their yields per hectare, averaged for the past 5 years, were substantially higher, amounting to 15 quintals in the case of legume mixtures. With this yield it is

then possible to expect (while maintaining the same proportion of straw to cereal) 261 kg of proteins, 1447 starch units, and 1,839 increased starch units. The production of proteins per hectare in legumes even at the stated still relatively low yield per hectare, is the highest.

Labor costs, which in this instance include the costs for manual, horse, and tractor labor, amounted to 56.1% of the direct costs for barley, 56.5% for oats, 51.4% for legumes, and as much as 72.5% in growing seed corn. The largest portion of these labor costs accrued to the harvesting of all the observed crops and fluctuated in the range of 50%. In the case of seed corn, a considerable portion of direct costs involved labor in connection with cultivation (33.5%). The proportionate costs of labor wages moved in the range of 60% for barley, oats, and mixtures; in the case of corn they were substantially higher, amounting to 78.7%. The highest proportion for this crop, including cultivation, was, however, 93.8%.

In evaluating the second main economic index, i.e., the costs per unit of produced nutrients (Table II), we see that the lowest direct and total costs per starch unit were those of barley. In the enterprises of the corn - and beet - growing areas, the difference between the costs per unit of nutrients for barley and corn increased further in favor of barley, despite the fact that corn yielded even in this instance a substantially higher production of nutrients per hectare. The highest costs per starch unit in the average of the examined enterprises were observed for legumes. In converting the hectare yields into production per hectare (15.0 quintals) and averaging it for the last 5 years, these costs, however, diminish and come roughly close to the average of the costs of the compared forage crops.

As concerns the evaluation of the profitability of various types of forage crops with a protein content and grown primarily or exclusively to supplement the proteins which certain agricultural enterprises are missing (for example, lima beans, peas, soybeans, beans, lupines, vetch, legumes, and legume mixtures, etc.), it is absolutely necessary to estimate the costs of the production of each kilogram of proteins. We have included this calculation, because legume-grain mixtures are actually more widely grown crops intended exclusively for feeding purposes (pure crops of legumes are grown predominantly for seed). Just as when other grain crops are used for feeding, the protein count, because it may be lower in a particular species, must be examined.

II. THE DIRECT AND TOTAL COSTS PER 100 KG OF NUTRIENTS (INCLUDING BY-PRODUCTS)

Indexes	Barley: all enterprises	Barley: enterprises of corn - beet - growing areas	Oats	Corn	Legume (mixtures)
Direct costs per 100 kg:					
a) proteins	947	755	862	1094	573
b) starch units	77	61	86	84	104
c) increased starch units	68	54	74	75	81
Total costs per 100 kg:					
a) proteins	1494	1180	1358	1659	838
b) starch units	121	95	135	127	151
c) increased starch units	108	85	117	114	119

It is evident from the data in Table II that the production of each kilogram of proteins was, where legumes are concerned, far cheaper than in case of other forage crops, this being so even despite their insufficient yields. This shows that the cultivation of these crops is fully justified, even though only average results are achieved.

Let us compare in form of a table, in a similar manner as in the comparison of the production and main financial indices, the number of hours spent per hectare and per quintal of the main products and the main indexes of labor productivity (Table III).

III. THE NUMBER OF HOURS SPENT PER HECTARE AND SOME INDICES OF LABOR PRODUCTIVITY IN THE AVERAGE OF THE EXAMINED ENTERPRISES*)

Indexes	Barley	Oats	Legumes	Average 1-3	Corn
	1	2	3	4	5
Hours spent per hectare:					
a) manual	119.3	95.5	86.5	100.4	374.6
b) tractor	13.7	13.1	11.5	12.8	21.3
c) animal-team drawn	23.5	19.9	16.1	19.8	34.1
Produced per 100 manual hours (including by-products):					
a) starch units	1690	1498	1370	1519	904
b) increased starch units	1896	1721	1741	1786	1008
Obtained per 100 kcs of expended wages:					
a) starch units	362	346	309	339	209
b) increased starch units	406	397	392	398	233
Average manual - labor hours required per quintal of grain	5.3	5.4	7.0	5.9	13.4

*) The number of hours spent in spreading manure was adjusted (reduced or increased) according to the effect of manure on the soil.

Where barley is concerned, as well as oats and legume-crop mixtures, the expenditure of manual, draft-animal, and tractor hours per hectare did not vary significantly. A certain deviation in the case of barley arose partly because of substantially higher yields per hectare and partly because of the fact that in two cases it was necessary to harvest a major portion of the area with a cutting machine or even by hand. In contrast to this, the legume-mixture harvests at the examined enterprises have been mechanized to a much higher degree. The need for manual labor in the case of seed corn was more than 3.5 times higher, as compared with other

grain crops. This indicates that the present level of mechanization of the cultivation and harvesting of this crop is a most serious economic problem. This becomes apparent when we examine the number of manual hours spent per quintal of grain crops, which in comparison with other crops was twice as high as in the case of corn. This was the case also in regard to the quantity of starch units produced per each 100 hours of manual labor or per 100 Kcs of expended wages, which is quite unfavorable, although the yield per hectare, the content of starch values, and productive capacity expressed in these feed units of nutrients, substantially exceeds the other tested forage cereals.

If a better mechanization than that which generally prevails today were introduced, the productivity of labor in growing corn could be substantially increased. This would also reduce the harvest costs of every quintal of cereals and of the fodder nutrients produced. Let us show this with the results obtained by the Research Institute of Agricultural Economics of the Czechoslovak Academy of Agricultural Sciences in doing work on another research project, in which the fulfillment of norms is compared on the basis of varying degrees of mechanization.

	Degree of mechanization		Index (Degree I = = 100%)
	I.	III. (complex)	
Sowing	1.14	1.45	127.2
Cultivation	24.34	15.98	65.7
Total	25.48	17.43	68.4
Harvest (excluding hand pulling), including hauling of straw	15.78	4.10	25.3

The first steps of mechanized sowing were accomplished with the help of horse-drawn implements while using the current method of row sowing; at later stages the SKG 6 machine was used for sowing crosswise. While more labor was required to take care of the crosswise sowing, it was possible to save labor in cultivation and hoeing so that the total saving in sowing and cultivation amounted to 8.05 norms per hectare, i.e., 31.6% of the working time.

Still bigger savings in working hours were gained in husking the corn and in shredding and hauling the straw: this amounted to 11.68 norms per hectare, i.e., 74.7%.

The most favorable figures on labor productivity, just as in the case of financial indices, were again obtained with barley, despite the fact that the need for manual labor, and the costs connected with it, were, for extraordinary reasons, higher per hectare.

The main general conclusions which may be drawn from the results obtained in examining the enterprises of state farms and the statistical material mentioned in this paper concerning barley, oats, corn, and legumes, may be summed up in the following points:

1. In spite of a notable shortage of fodders in many enterprises, the fodder stock was in some cases needlessly depleted by a continuously belated harvest of straw, barley, oats, and legumes with combines. Equally so, the hauling of corn stalks has sometimes been delayed until the second half of November, so that it could not be used for silage, some of it being left behind in the field and plowed under. Belated hauling of straw was due primarily to poor mechanization, faulty organization of labor, and, in some cases, to badly selected crops which have greatly delayed the harvest. This concerns mostly all varieties of corn and especially oats.

2. The largest amount of nutrients per hectare in the form of starch units was obtained from corn. Its productive capacity was also markedly higher than that of barley grown under similar soil conditions. Legumes reach the highest productive capacity in proteins even in an average harvest, which, of course, is low; legumes grown in crop mixtures not only help gain higher yields per hectare, but also a much higher production of nutrients, including proteins.

3. The increased amount of square-hill corn sowing did not turn out satisfactorily, and hoeing and thinning therefore required a great amount of working time in the total average of enterprises they examined. Combines were little used in harvesting. The total labor savings in sowing and cultivation together amounted to over 30% of performance norms when using the square-hill sowing method and to almost 75% with combine harvesting.

4. The most substantial of the direct costs are the labor costs. Out of these the largest proportion accrued to harvesting work of all crops which still remain relatively poorly mechanized. This can also be seen in the proportionate wages, which on the average amounted to 73%, while for soil preparation and sowing only 49% of labor costs were used.

5. Although the direct and total costs per starch unit in legumes were higher than those of barley and oats, and although these direct and total costs were higher than those of corn as compared with the yields obtained per hectare in 1957, which were very much below average, their cultivation should not be underestimated; to the contrary. The general shortage of proteins in agricultural enterprises demands that they be increased, since these irreplaceable nutrients cannot always be substituted by the proteins in coarse fodders, even though their production may be cheaper. From this point of view it is therefore necessary to examine also the growing of legumes and mixtures of them.

The production of protein, a very scarce feed nutrient, proved to be least expensive in legumes. By selecting suitable mixtures and by following basic agrotechnical measures, it is possible to raise greatly protein yields and to reduce substantially the costs of producing proteins. This was also proved by the results of some of the examined enterprises, since the increase of yields per hectare is the main requisite in reducing the costs per unit of produced nutrients. Enterprises which have produced higher yields per hectare have, it is true, spent more per hectare, but the costs per unit of nutrients were lower.

6. The lowest costs per starch unit or per increased starch unit were achieved in growing barley. In enterprises of the corn - and beet - growing areas, which had higher yields per hectare, the difference in the costs per starch unit of barley as against other grains, including corn, has further increased. In order to achieve the same level of direct costs per starch unit for barley and corn it would be necessary, under the present standard of mechanization, to have per-hectare corn yields approximately 8 quintals higher than those of barley.

7. Big discrepancies between individual enterprises in the same production areas, particularly the differences in yields per hectare and the costs of crops per hectare, as well as the costs per unit of produced nutrients and the attained labor productivity, point to great possibilities for increasing the production of grain fodder while reducing the costs. To improve the situation of all crops it is necessary, besides increasing the yields per hectare, to improve the organization of labor, agrotechnics, etc.; to focus systematic attention on increasing the mechanization of labor, mainly corn - harvesting and cultivation work.

Out of the total area sown with crops in Czechoslovakia, approximately 27% was used for sowing forage crops (including corn) and approximately 2% was sown with legumes and legume-mixtures. The great importance of these grain fodders, and at the same time, the failure to keep up with the demands of our

agricultural production, are shown by the statistics on imports of the mentioned fodders. Out of the total quantity of nutrients imported in the form of fodder in 1957, 40.2% was contributed by barley, oats, corn, and forage legumes in digestible proteins and 43.4% in starch units, while barley alone contributed approximately 75% in both nutrients. This confirms the necessity of paying more attention to these forage crops and to primarily increasing the yields per hectare.

Root Crops

Root crops contain easily - digestible nutrients, predominantly carbohydrates. In feed rations it is necessary, therefore, to supplement these with other fodders having a protein content.

Potatoes, field beets, and sugar beets are among the roots crops included in this study, even though in the current year the total harvest of these crops was used exclusively in industry (this explains why these crops are usually classified as industrial crops). The reason we have included them here is that their by-products, i.e., tops, pulps, and molasses are in the beet-growing areas a very important element of the fodder stock. Furthermore, it would be advantageous to expand their cultivation in some areas for feeding purposes as well.

While the importance of field beets as fodder is due mainly to their peculiar and dietary properties (and this applies in the case of all farm animals), potatoes form the main element of the feed rations for hogs. However, potatoes may be used to feed most farm animals. So far as sugar beets are concerned, it is impossible to imagine the stock of any enterprise in beet-growing areas without sugar-beet by-products.

To present statistically the main economic indexes of the root crops examined, the following average content of nutrients was worked with (given in percentages):

	Proteins	Starch units	Increased starch units
Potatoes	1.0	18.0	19.5
Fodder beets:			
roots	0.3	7.5	8.0
tops	1.0	5.0	6.5
Sugar beets:			
roots	0.5	15.0	15.8
tops	1.3	7.3	9.3
pulps	0.3	6.0	6.5
molasses	-	40.0	40.0

The quantity of nutritive values produced per hectare of land in the case of the examined root crops is given in Table IV. It concerns again both the main products and the by-products.

The most productive crop of the enterprises examined, sugar beets, was tested in the category of forage crops. The lowest quantity of feeding values was found to be contained in potatoes. This concerns proteins as well as starch units. The quantity of starch units produced in potatoes, forage beets, and sugar beets was proportionately 1.00:1.31:1.90. The quantity yielded by sugar beets was therefore almost twice as large as that of potatoes and 45% higher than that of field beets. These proportions remain unchanged even when averaging the production of the mentioned crops in per-hectare yields in Czechoslovakia for the years 1953-57. The computation is made in order to verify the correctness of the ascertained results and the conclusions of this work, taking into account a certain difference between the per-hectare yields established in examining the enterprises concerned and the state-wide yields. The proportions of the quantities of the units produced are then as follows:

IV. COMPARISON OF THE PRODUCTION CAPACITY OF ROOT CROPS (AVERAGES OF THE EXAMINED ENTERPRISES)

Indexes	Potatoes	Fodder beets	Sugar beets	By-products of sugar beets
Yield per hectare:				
a) bulbs --roots	172.12	452.87	337.56	-
b) tops	-	132.10	112.58	112.58
c) pulp	-	-	-	198.40
d) molasses	-	-	-	1.68
Production of nutrients per hectare:				
a) proteins	172	268	315	206
b) starch units	3098	4057	5883	2079
c) increased starch units	3356	4482	6377	2404

	Potatoes		Fodder beets (including turnips)		Sugar beets
Total for the Czechoslovak Republic	1.00	:	1.10	:	1.78
Thereof: Farms	1.00	:	1.44	:	2.21

If we consider the relatively high content of nutrients in seed potatoes, then the given proportion is further increased, since in the case of fodder and sugar beets a relatively small acreage is sufficient to produce the necessary amount of seed. As regards the achieved per-hectare yields and the quantity of seed used in the examined enterprises, the production of starch units in potatoes is reduced by approximately 16%, it being reduced by approximately 2% in field and sugar beets.

As far as the independent by-products of sugar beets are concerned (while using sugar beets as an industrial crop), chopped tops, pulp, and molasses are contributing a substantial amount toward securing the fodder base. On the average, in the studied enterprises these by-products have furnished per hectare such a quantity of starch units as would be obtained from 0.67 hectare of potatoes or 0.51 hectare of field beets.

Mechanization in growing root crops is at a very low level. This can be seen in the proportion of the total labor costs in the direct costs and the proportion of wages at particular working stages (Table V).

Labor costs constitute a high proportion of direct costs; for field beets and sugar beets they amounted to almost 3/4. An equal proportion of labor costs -- and this applies also to potatoes -- is paid out in wages. This high proportion, next to crop-harvesting labor, is due in the case of potatoes to the first working stage, namely, soil preparation and planting; the actual planting, including preparation of potato seedlings, requires 315 Kcs in wages per hectare, or 76.5% of the total labor costs for this working operation. Compared to this, the greatest proportion of the wages for field and sugar beets is expended for cultivation, about 95%.

The unsatisfactory state of mechanized labor operations is apparent here from the great quantity of labor used, and especially from the proportions between manual, tractor, and animal-drawn labor hours. In Table VI these figures are given in comparison with the average data of the examined grain forage (barley, oats, and legume-mixtures).

V. COMPARISON OF THE PROPORTION OF LABOR COSTS AND EXPENDED WAGES

Working stage	Potatoes	Fodder beets	Sugar beets
Proportion of labor costs in direct costs in %	54.1	74.1	71.9
Proportion of wages in the working costs in % for:			
a) Soil preparation, sowing and planting	62.3	55.4	55.8
b) Cultivation	55.5	95.0	94.5
c) Harvest	83.0	76.8	72.2
d) Total	73.4	78.4	77.1

VI. COMPARISON OF HOURS SPENT PER HECTARE AND THEIR PROPORTION

Indexes	Potatoes	Fodder beets	Sugar beets	The average of grain crop
Number of hours per hectare:				
a) manual	407.5	701.4	577.0	100.4
b) tractor	19.0	15.4	30.3	12.8
c) animal-team drawn	76.4	99.3	74.4	19.8
Ratio of amount of labor hours spent (tractor = 1.0)	21.4:1.0:4.0	45.5:1.0:6.4	19.0:1.0 2.5	7.8:1.0:1.5

The unsatisfactory state of mechanization becomes rather obvious, especially in the case of certain important work operations such as the planting, cultivation, and plowing of potato fields; the thinning of field and sugar beets; and other operations. This, together with the work operations which have not yet been mechanized because of still-unsolved technical problems (thinning, hoeing, combine harvesting), creates a very serious economic problem.

The great amount of manual labor expended has had a decisive impact on some of the most important economic factors -- the profitableness and productivity of labor in growing these forage crops -- and has affected the extent to which forage crops are grown on a state-wide scale.

A comparison of the economic profitableness of growing potatoes, field beets, and sugar beets from the viewpoint of costs is given in Table VII.

The results presented here show a difference in regard to the various crops examined. The production of nutrients in the form of starch units is by far the least expensive in the case of sugar beets; next come field beets, the least advantageous being the potato indexes. We therefore, have the same sequence as in the production of nutrients per hectare.

The evaluation of the suitability of growing the individual types of crops examined, as relates to the third important economic index -- labor productivity, is given in Table VIII.

The highest labor productivity was again achieved in growing sugar beets because of their high production of nutrients per hectare. Second highest came potatoes, despite having a lower productive capacity than field beets. This is the result of the less satisfactory state of mechanization, especially as pertains to cultivation.

Essentially, it may be said that the labor productivity in growing sugar beets is almost twice as high as with field beets and about one quarter higher than with potatoes.

VII. COMPARISON OF THE DIRECT AND TOTAL COSTS PER 100 KG OF NUTRIENTS IN KCS (INCLUDING BY-PRODUCTS) (AVERAGES OF THE ENTERPRISES EXAMINED)

Indexes	Potatoes	Fodder beets	Sugar beets
Direct costs per 100 kg:			
a) starch units	152	126	89
index	170.8	141.6	100.0
b) increased starch units	140	114	82
index	170.7	139.0	100.-
Total costs per 100 kg:			
a) starch units	234	212	151
index	155.0	140.4	100.0
b) increased starch units	216	192	139
index	155.4	138.1	100.0

VIII. COMPARISON OF SOME INDEXES OF LABOR PRODUCTIVITY

Indexes	Potatoes	Fodder beets	Sugar beets
Average of the enterprises examined:			
Produced per 100 reduced manual hours (including by-products):			
a) starch units	760	571	1020
b) increased starch units	824	631	1105
Obtained by spending 100 Kcs in wages:			
a) starch units	171	137	203
b) increased starch units	185	151	220

The main over-all results established on the basis of the statistical and comparative figures for potatoes, field beets, and sugar beets can be summed up as follows:

1. In building up the fodder base of agricultural enterprises and in comparing the productive capacity of various fodders, it is necessary to keep in mind, in regard to root crops, and even more so where other forage crops are concerned, the quantity of nutrients contained in their seeds or the acreage required for growing the seeds, because this quantity can be reduced in productive capacity. Judging from the results which were obtained for all the enterprises examined, the production of potatoes decreases because of poor potato seedlings by approximately 16%, and because of defective sugar- and field -beet seed by only approximately 2%.

2. The most productive of the main varieties of root crops are sugar beets grown exclusively as a forage crop. They yield more or less the same quantity of starch units as do potatoes and one half more than fodder beets. If we rate sugar beets according to current standards, that is, exclusively as an industrial crop, their by-products, too, can be considered an important element in the fodder base. In the yield of all the enterprises examined (which is roughly at the average level to be reached during the period 1961-65), they constitute a production of starch values which corresponds to 226 quintals of forage crops and 115 quintals of potatoes. A great loss of nutrients in by-products (which has happened with forage straw), however, often stems from a late harvest and, therefore, the spoilage of beet tops.

3. In regard to the high productive capacity of sugar beets, considered as a forage crop, the economic indexes of suitability, as indicated by the level of direct and total costs per unit of produced nutrients as against other more suitable forage root crops, are also important, despite the markedly high costs per hectare. Next to sugar beets come field beets, and then fodder potatoes, although the expenses per unit here are the lowest.

4. The productivity of labor measured by the number of starch units per 100 converted manual hours or per 100 Kcs in wages is again highest (with regard to high productive capacity) with sugar beets. It is approximately 1/4 higher than that of potatoes and almost twice as high as that of fodder beets. Despite the fact that the production of nutrients from potatoes per hectare is lower than that of fodder beets, the productivity achieved in growing this crop is higher, which is due mainly to a more satisfactory degree of mechanization.

5. With a content of 15.0% of starch units in the root of a sugar beet, 7.3% in chopped tops, and at a proportion of root yield to chopped tops of 1.0:0.3, there accrues to each quintal of harvested sugar beets, including chopped tops, 17.2 kg of starch units [15.0 + (7.3 x 0.3) = 17.2]. If we calculate that potatoes contain an average of 18.0% of starch units, then the production of starch units per hectare is equivalent in the case of these crops if the hectare yield of sugar beets is higher by only 4.7% [(18.0 x 100) : 17.2 = 104.7]. At higher per-hectare yields sugar beets provide more nutrients than potatoes per hectare.

If the financial costs per starch unit of sugar beets are to be lower than those of potatoes, it is necessary, at the present level of mechanization, that their hectare yield be higher by approximately 30% (as a consequence of higher costs per hectare than in the case of potatoes). An economical large-scale introduction of sugar beets requires, however, at the same time that a higher degree of mechanization be instituted so that labor productivity may further increase and costs decline. An indispensable requisite is the introduction of such mechanical and other means as would at least partially speed up the thinning job and perfect harvesting combines and loaders. In the case of sugar beets the harvest work consumed more than 40% of total labor costs.

6. In the case of potatoes, which even in the future will remain one of the important forage crops, it is first of all necessary to focus attention on increasing the yields per hectare as a basis for the necessary improvement of their economic suitability. As regards this root crop, however, even the mechanical tools of today are not always put to the fullest use. This concerns mainly potato-planting machines. It is thus the improvement

of the organization of labor which, although very unsatisfactory in many enterprises, is a requisite for increasing the profitableness of potato growing. It is likewise necessary to devote systematic attention to the perfection of the harvesting combines which are being tested in our country, and to their rapid introduction into practical use, since a decisive increase in labor productivity, which is very low in potato production, will be possible with the help of these combines, thus substantially reducing harvesting spoilage.

*

The reduction in the areas sown with certain main root crops brought about in the postwar years by economic and particularly labor factors is economically justified but has not been balanced out by an increase in yields per hectare as the main factor in eliminating unsatisfactory economic results in cultivation. The average hectare yields for the period 1953-57, as compared with the period 1934-38, have gone up only insignificantly: potatoes by only 4.4%, fodder beets (including turnips) by 2.6%, and sugar beets by only 9.6%. The biggest direct economic deficiency is thus the low level of the mechanization of labor, as can be seen from the structure of labor costs, the proportion between wages, and expenditures in manual, tractor, and animal-drawn hours, especially as they relate to one another.

Forage Crops

Forage crops sown on arable land form in our agricultural enterprises, together with pastures, the foundation of the forage supply. From the point of view of nutritive values most forage crops which are fed to all groups of animals can be replaced or substituted. Certain species (or varieties) of forage crops having different growth and maturing periods, having different nutrient contents, and requiring different storage and silage conditions, enable each individual agricultural enterprise to secure satisfactory feeding with fodders and forage crops throughout the whole year.

The economic effectiveness of growing forage crops -- and in this group we have included, because of its wide usage, fodder cabbage -- is evaluated, similarly as with other groups of fodders, from the viewpoint of the production of nutrients per hectare, the costs per unit of nutrients, and the achieved labor productivity.

The following composition of feeding forages was used for a statistical presentation of these main economic indexes:

	Nutrient content in %		
	Proteins	Starch units	Increased starch units
Red clover in blossom -- green forage	1.7	11.9	14.1
Vetch in blossom -- green forage	1.9	11.5	14.4
Winter mixtures -- green	1.6	10.5	12.9
Spring mixtures -- green	1.7	8.0	10.7
Green fodder corn	0.6	8.0	8.9
Fodder cabbage	1.2	8.0	9.8
Silage corn -- with different stand thickness and maturity of ears:			
a)	0.7	10.0	11.1
b)	0.7	11.0	12.1
c)	0.7	12.0	13.1
d)	0.7	13.0	14.1
e)	0.7	14.0	15.1
Red clover in blossom -- hay	6.5	36.0	45.8
Vetch in blossom -- hay	7.1	27.0	37.7
Meadows -- hay of good quality	4.0	33.0	39.0
Meadows in blossom -- grass	1.5	12.5	14.8

In evaluating individual indexes and especially in evaluating their productive capacity, it is necessary to compare separately the main crops, namely, crops which are grown the year around (for example, spring mixtures, silage corn of green-fodder corn, fodder cabbage, clovers, meadows) and to put into a separate category the intermediate crops and succeeding crops, or to evaluate the last two together, since their products are obtained within one economic

year. Only forage crops (fodders) which may be substituted for one another in feed rations, and fodders designed for feeding during the same period of the year, may be compared. It is possible, therefore, to compare silage with dry or green forages, for example, if we want to use silage for feed already in the summer period, etc. For the above reasons, the indexes in Table IX, showing the production of nutrients and the direct and total costs, are a statistical enumeration of crops which may be used either for fodder directly following the harvest or cured by drying and silaging, partly immediately after the harvest, or partly when depreciation and spoilage due to curing processes have occurred. Presented in a similar way are the direct and total costs per 100 starch and increased starch units.

The highest production of nutrients, i.e., starch and increased starch units, was achieved with silage corn. Its yield was, for instance, 4.2 times higher than the yield of spring mixtures of green fodders, 3.2% higher than that of meadows (grass), 2.4 times higher than that of clover (green forage), 1.7 times higher than that of fodder cabbage, etc. Silaged corn also yielded, on the average, a bigger amount of nutrients than winter and spring mixtures put together (1.8 times more), and even more than winter mixtures and green-fodder corn together (1.3 times more). Fodder cabbage in the examined enterprises yielded a relatively high production of starch units, surpassing in proteins even clover. The production of nutrients in the case of this crop -- except in enterprises with high yields per hectare -- was, however, expensive and the productivity of labor low.

As for especially digestible proteins, the highest production was achieved with the earlier-mentioned fodder cabbage, clover, silage corn, spring mixtures; and the lowest, because of an unsatisfactory productive state, with meadows. Per hectare of land -- during one year -- the highest production of proteins was attained from winter and summer mixtures together. Labor productivity, and especially the costs per unit of all nutrients produced, were in this case considerably less favorable than, for example, in the case of clover or a crop so demanding as regards cultivation as silage corn.

Certain changes in the production level are noticeable if we observe the amount of seed and the acreage needed to obtain this production; this concerns primarily clover, cabbage, and silage corn.

The lowest costs per 100 fodder units produced were achieved with clover directly used for feed. Using as a basis (100 percent) the direct costs per 100 increased starch units of clover for green fodder, the production of other forage was more expensive by 34 percent in the case of grass, 47% in the case of winter mixtures,

68% in the case of green-fodder corn, 58% in the case of winter mixtures and green corn, 89% in the case of spring mixtures, 126% in the case of summer mixtures (76% in the case of winter and summer mixtures put together), 208% in the case of fodder cabbage. Only the production of nutrients in silage corn came closer to the costs of clover, being higher (if we disregard spoilage due to fermentation) by only 16%.

The costs of nutrients in silaged fodder were generally higher than those in green fodder in the same crop. This was due to spoilage caused by fermentation and greater silaging costs. In the case of silage corn the production of nutrients, despite the aforementioned greater costs and losses in nutrients unavoidably connected with the conservation, was however, cheaper than in the case of all forages directly consumed in feeding, except for green grass and clover, thanks to their high nutrient yield. The costs of producing 100 kg of fodder units were substantially higher in drying than silaging, this being due to a higher spoilage of nutrients caused by this method of forage conservation.

In evaluating profitability and in seeking ways to increase it, in considering forage crops it is necessary to take much more into account the extent of labor costs, which form a substantial component of total costs. These have amounted to 49.8% of direct costs in the case of individual kinds of forage crops (mixtures for drying) and up to 73.3% in the case of meadow hay. The proportion of these costs in the individual working stages and the proportion of wages in the total labor costs is given in Table X.

[adjoins page 55 here]

IX. PRODUCTION OF NUTRIENTS AND DIRECT AND TOTAL COSTS OF FORAGE CROPS(IN THE EXAMINED ENTERPRISES)

Indexes	Green forage							
	Winter mix-ture	Spring mix-ture	Summer mix-ture	Green fodder corn	Fodder cab-bage	Clo-vers	Grass	Winter mix-ture and green fodder corn
Yield per hectare in q	192.12	161.22	127.62	288.61	412.38	194.75	135.87	480.37
Production per ha:								
Digestible proteins	307	274	217	173	495	363	204	480
Starch units	2017	1290	1021	2309	3299	2240	1698	4326
Increased starch units	2478	1725	1366	2569	4041	2785	2011	5047
Losses due to fermentation and storing:								
Starch units	x	x	x	x	x	x	x	x
Increased starch units	x	x	x	x	x	x	x	x
Production after deduction of losses:								
Starch units	x	x	x	x	x	x	x	x
Increased starch units	x	x	x	x	x	x	x	x
Costs per hectare:								
Direct	1380	1238	1181	1650	4722	1057	1021	3030
Total	1854	1702	1556	2296	7835	1518	1580	4150

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Indexes	Green forage							
	Winter mix- ture	Spring mix- ture	Summer mix- ture	Green fodder corn	Fodder cab- bage	Clo- vers	Grass	Winter mix- ture and green fodder corn
Direct costs per:								
100 starch units	68	96	116	71	143	47	60	70
100 increased starch units	56	72	86	64	117	38	51	60
Total costs per:								
100 starch units	92	132	152	99	237	68	93	96
100 increased starch units	75	99	114	89	194	55	79	83
Costs after deduction of losses:								
a) direct costs per:								
100 starch units	x	x	x	x	x	x	x	x
100 increased starch units	x	x	x	x	x	x	x	x
b) total costs per:								
100 starch units	x	x	x	x	x	x	x	x
100 increased starch units	x	x	x	x	x	x	x	x

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Indexes	Green forage	Silage				Hay		
	Winter and summer mixture	Silage corn (content of 11% starch units)	Green fodder corn	Winter mixture	Spring mixture	Mixtures	Clovers	Meadows
Yield per hectare in q	319.74	496.23	288.61	169.43	180.33	33.77	44.55	31.74
Production per ha:								
Digestible proteins	524	347	173	287	307	169	306	127
Starch units	3038	5459	2309	1884	1443	1013	1403	1047
Increased starch units	3844	6004	2569	2315	1930	1266	1862	1238
Losses due to fermentation and storing:								
Starch units	x	1092	462	377	288	81	112	84
Increased starch units	x	1201	514	463	386	101	149	99
Production after deduction of losses:								
Starch units	x	4367	1847	1507	1155	932	1291	963
Increased starch units	x	4803	2055	1852	1544	1165	1713	1139
Costs per hectare:								
Direct	2561	2650	1864	1684	1582	1399	1120	933
Total	3410	3863	2793	2294	2439	1944	1717	1589

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Indexes	Green forage	Silage				Hay		
	Winter and summer mix-ture	Silage corn (con-tent of 11% starch units)	Green fodder corn	Winter mix-ture	Spring mix-ture	Mix-tures	Clo-vers	Mead-ows
Direct costs per:								
100 starch units	84	49	81	89	110	138	80	89
100 increased starch units	67	44	73	73	82	111	60	75
Total costs per:								
100 starch units	112	71	121	122	169	192	122	152
100 increased starch units	89	64	109	99	126	154	92	128
Costs after deduction of losses:								
a) direct costs per:								
100 starch units	x	61	101	112	137	150	87	97
100 increased starch units	xx	5	91	91	102	120	65	82
b) total costs per:								
100 starch units	x	88	151	152	211	209	133	165
100 increased starch units	x	80	136	124	158	167	100	140

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X. THE STRUCTURE OF LABOR COSTS

Crop	Working stage: Soil preparation and sowing	Working stage: Cultivation	Working stage: Harvest	Wages	Total labor costs	Proportion of wages out of total labor costs
	in %			in Kcs		in %
Green winter mixture	45.7	0.6	53.7	380	709	53.6
Silage winter mixture	37.8	2.0	60.2	486	925	52.5
Green spring mixture	44.5	0.3	55.2	359	677	53.0
Silage spring mixture	33.8	0.7	65.5	584	988	59.1
Green summer mixture	48.8	-	51.2	315	609	51.7
Mixture hays	47.5	0.3	52.2	424	697	60.8
Silage corn	25.8	8.1	66.1	1025	1770	57.9
Green fodder corn	34.0	3.0	63.0	540	1084	49.8
Green fodder corn — silaged	28.4	2.5	69.1	791	1298	60.9
Fodder cabbage	33.1	29.8	37.1	2293	3152	72.7
Clovers — green forage	14.4		85.6	322	547	58.9
Clovers — dry forage	15.5		84.5	439	619	70.9
Meadows — grass	16.8		83.2	497	624	79.6
Meadows — dry forage	17.4		82.6	484	684	70.8

The largest proportion of wage costs in the labor costs in the case of all the examined forage crops fell to harvest work. If we disregard fodder cabbage, which is considered a root crop because of the way it is grown, the given proportion amounts to at least 51.2% and reaches as high as 85.6%.

The highest proportion is found with silage crops and hay, and mainly with perennial forage crops (of course in this case the absolute cost, together with meadows as expressed in Kcs, is the lowest), which also show the highest proportion of wage costs in the total labor costs. Harvesting labor, then, constitutes here the basic cost component determining the degree of profitableness of the given crop. For this reason the attention in reducing costs must be focused chiefly on this stage of work.

A comparison of the suitability of growing individual types of forage crops according to a further economic index -- labor productivity -- is given in Table XI.

The highest labor productivity, as relates to crops directly used for fodder, was attained with clover (3,303 starch units per 100 man-hours); and the lowest with fodder cabbage (554 starch units, that is, only 1/6 as much).

The production of silage-corn nutrients per 100 man-hours, even after deductions of spoilage occurring in silaging, was almost equal to that of the winter and summer mixtures (evaluated together) harvested for green fodder. The labor productivity achieved in silaging and drying other forage was of course substantially lower than in the case of the same crops used directly for feeding.

Just as in the case of production per hectare and the costs per unit of nutrients, so in the case of labor productivity better indexes were achieved in silaging than in drying forage crops of the same types.

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XI. THE INDEXES OF LABOR PRODUCTIVITY IN FORAGE CROPS

Indexes	Green forage: Winter mix-tures	Spring mix-tures	Summer mix-tures	Green fodder corn	Fodder cab-bage	Clo-ver	Grass*	Winter mix-ture and green fodder corn	Winter and summer mix-tures
Produced per 100 manual hours in nutrients:									
a) Total: Starch units	2292	1554	1307	1940	554	3303	1206	2090	1829
Increased starch units	2815	2078	1749	2159	678	4107	1428	2438	2314
b) After deducting losses due to fermentation and storing									
Starch units	x	x	x	x	x	x	x	x	x
Increased starch units	x	x	x	x	x	x	x	x	x
Obtained per 100 Kcs in wages:									
a) Total: Starch units	531	359	324	428	144	696	342	470	437
Increased starch units	652	481	434	476	176	865	405	549	553
b) After deducting losses due to fermentation and storing:									
Starch units	x	x	x	x	x	x	x	x	x
Increased starch units	x	x	x	x	x	x	x	x	x

*) Added up from 3/4 done by hand.

Indexes	Silage: Silage corn (containing 11% starch units) (silaged)	Silage: Green fodder corn	Silage: Winter mixture	Silage: Spring mixture	Hay: Mixtures	Hay: Clovers	Hay: Meadows
Produced per 100 manual hours in nutrients:							
a) Total: Starch units	2199	1243	1365	1036	976	1484	889
Increased starch units	2418	1383	1678	1385	1220	1970	1051
b) After deducting losses due to fermentation and storing							
Starch units	1759	994	1092	829	898	1366	817
Increased starch units	1934	1106	1342	1108	1122	1813	967
Obtained per 100 kcs in wages:							
a) Total: Starch units	533	292	388	247	239	320	216
Increased starch units	586	325	476	330	299	424	256
b) After deducting losses due to fermentation and storing:							
Starch units	426	234	310	198	220	294	199
Increased starch units	469	260	381	264	275	390	235

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In the case of forage crops, the main general results established by means of research in the examined state-farm enterprises, and especially on the basis of the indexes presented and compared, can be summed up as follows:

1. Winter mixtures evaluated together with summer mixtures, and especially with green-fodder corn (these are the crops which usually follow), yielded a high quantity of nutrients per hectare. The direct costs for increased starch units were relatively low as regards this crop, and in the case of forage used directly for feed, followed immediately after clover and grass. Likewise, the achieved labor productivity was one of the highest in the case of winter mixtures. In building up the fodder base, its economic advantage and importance rest first of all in providing the first green forage of the year, which makes it possible to increase the amount of the first crop of perennial forages in the form of hay. The fact that this is the first green fodder of the season, the volume of which is increased, insures its higher effectiveness, and because it is used directly as forage, it involves the lowest production costs.

For all these reasons one cannot, therefore consider as proportionate its share in the arable land, which amounted to 2.7% of that of the examined enterprises in 1957 and 3.3% in 1958.

2. The acreage sown with spring mixtures was substantially increased in the postwar period both in absolute and in relative terms as compared with the change in the proportion between forage crops sown on arable soil, which in 1957 were sown on 4% of the arable land on a state-wide scale. In the case of state farms their production on arable land was higher than in other sectors, almost equalling the proportion of all covers. This has occurred mainly because the prevailing part of state farms are taking over every year large areas of new land which, often because of the late sowing of other crops, have previously been sown with spring mixtures. Often other reasons, such as the organization of labor or production, the lack of a substantial labor force, etc., have also played a major role in this connection.

Increasing the acreage to be sown with spring mixtures is, however, not a correct measure. The achieved production of nutrients in all the cases of the examined crops was lowest in forage, being even lower than that of meadow grass, where -- in view of the not quite satisfactory conditions of meadows -- the production is on the average low. Therefore the costs for producing nutrients were among the highest; only the fodder nutrients of cabbage and summer mixtures were produced at yet higher costs. Unsatisfactory also was the labor productivity. Therefore a reduction in this crop to the minimum acreage necessary to supply only green fodder in late spring and early summer will be fully justified.

3. Green-fodder corn as a succeeding crop, or summer mixtures with a higher admixture of corn and following spring mixtures, and especially the clover rowen, gave on the average higher yields per hectare and a higher production of nutrients than summer mixtures without an admixture of corn or with only a smaller proportion of it.

In the case of green-fodder corn with winter mixtures, the production of starch units achieved was approximately 1/5 higher than that of the winter mixtures and summer mixtures which followed (the production of proteins, however, was about 1/10 lower). The direct costs per 100 increased starch units and the labor productivity measured by the production of these units per 100 man-hours were in the case of the first group of crops (winter mixtures + green-fodder corn) more advantageous than in the case of the second group (winter mixtures + summer mixtures). The costs were lower by 10% and labor productivity higher by 5%.

The growing of green-fodder corn as the main crop (sown on approximately 1/5 of the acreage -- for example, after rye, oats, fodder potatoes, etc.) was, however, not justified by the achieved hectare yields, because a relatively shorter period of maturing suffices for the attainment of succulent forage.

4. The surplus of the material of all mixtures, as well as the corn or green forages, were silaged. The acreages of the ensiled crops were, however, in some enterprises too large. The economic indexes of both ensilaged and green-fodder corn (including winter mixtures) and the silaged mixture of all other varieties are less advantageous than those of silage corn grown as the main crop. (The calculation presupposes a content of 11.0% of starch and 12.1% of increased starch units.) After taking into account the spoilage due to fermentation, these differences in the production of increased starch units amounted to approximately 20%; in direct costs per 100 increased starch units, to approximately 40%; and, in labor productivity, almost 40%.

The stated differences point to the importance of planning as accurately as possible the acreage sown with forage crops and green feeding matter, and to the necessity of providing the main proportion of silage from the cheap crops and such as are typically suited for silage, mainly silage corn. Silage can then be enriched by adding perennial forage and meadow crops.

5. The growing of spring and winter mixtures for hay, the acreage of which has in some enterprises assumed enormous proportions, has proved itself to be uneconomical. The production of nutrients per hectare is low, and the costs per unit of nutrients, as compared with meadow hay (even despite the low yields) and especially clover hay, have increased out of proportion. The

direct costs per increased starch unit exceeded those of meadow hay by 1.5 times, those of clover hay by as much as 1.7 times; and this was mainly the result of the disproportionately greater costs for seed, soil treatment, and sowing.

6. It has been confirmed that silage corn can be successfully grown under almost any conditions, provided that the necessary agrotechnical measures are adhered to. It is one of the forage crops which can provide an exceptionally high production of nutrients per unit of land at low costs per unit of nutrients with a relatively high labor productivity. It has, however, also been confirmed that these indexes of economic effectiveness could be even more favorable if some deficiencies in growing this crop were eliminated. The acreage of corn, even despite a big expansion, especially in recent years, still does not correspond to its importance.

The main objective in growing silage corn -- obtaining the highest possible proportion of kernels from the total weight of the substance in the state of yellow-milky ripeness -- was in some enterprises not fulfilled. Corn was often sown in thick stands with too high a seed rate per hectare. Though it provided a large quantity of green forage per hectare, it had, however, a relatively low content of nutrients. Due to systematic propagation of agrotechnical principles, a substantial improvement was achieved in 1958. Greater care was also devoted to cultivation.

The acreage of silage corn sown by the square-hill method forms an insignificant portion, although the total costs expended and the productivity of labor connected with this method was substantially more favorable.

In the enterprises where sowing was accomplished in time, substantially better harvests were effected than in enterprises where sowing was late. In dividing the enterprises into two groups, the differences in yields per hectare amounted, for instance, in the beet-growing area to 22% and in the potato-growing area to 34%. Similar differences in yields per hectare were found also between the enterprises with different degrees of cultivation; on the average, these amounted to 20%.

The increasing mechanization and, above all, the complex combine harvests, made the proportion of wages, which in 1957 amounted to 65.2% of the total labor costs, drop to 55.6% in 1958. Nevertheless, even in this year some enterprises harvested a part of the acreage by horse-drawn machines or even by hand.

7. Fodder cabbage, which can greatly prolong the period of feeding with fresh forage throughout the year, was picked as late as December and occasionally even in January. In appraising the

level of costs it is therefore necessary to compare these costs not only for green forage, but also for silage, which is regularly fed during specific periods and which usually is more costly than forage crops fed directly off the fields.

At an average yield of 412 quintals per hectare, fodder cabbage furnished -- next to sugar and field beets and silage corn -- the highest quantity of starch units per hectare; its production of digestible proteins was highest of all the crops. The growing of this crop required a high number of manual hours due to poor mechanization and partly as a result of a relatively small acreage. These were the two main causes of high costs per hectare and thus also per unit of produced nutrients, as well as the cause of the low labor productivity in the average of the examined enterprises. Of all crops the indexes of this crop were the least favorable.

With suitable natural and economic conditions, however, where the agrotechnical measures indispensable for attaining a high yield and low labor and material costs were expediently carried out, good results were achieved in the indexes of profitableness and productivity. The examples of these enterprises show that the growing of this crop, especially as a succeeding crop, is fully justified, provided that all agrotechnical and economic principles and requirements are maintained, especially in crop rotation.

8. With reference to vetch, the costs of seed for the harvest of one economic year are, because they can be distributed over a number of years, lower than those of clover. The total costs of both types of clovers, however, are roughly equal, since expenses must be added in connection with later vetch cuttings. The main criterion in choosing between clover and vetch is therefore mainly the achieved production of nutrients per hectare.

The costs of one produced feeding unit in the case of fodders used for feeding directly in the fields were by far the most unfavorable, not only among all forage crops, but also among all the examined fodders in general. In regard to the costs of dry forage per unit of nutrients, the costs of meadows, and especially mixtures, were substantially lower. Similarly, the labor productivity was most favorable. If we proceed from the figures of the increased starch units which accrued to each 100 man-hours worked in the case of clover used for direct feeding (= 100.0%), then the productivity of the other crops was as follows: winter mixtures 68.6%, silage corn 58.9%, green-fodder corn 52.6%, spring mixtures 50.6%, summer mixtures 42.6%, and fodder cabbage 16.5%.

Notwithstanding the above facts, appropriate attention is not being given to clover, even though it is an eminently important forage crop both from the point of view of fodder and as a soil

improvement agent. The absolute and relative decline of the acreage on which clover is grown is, as compared with the prewar period and from the economic standpoint, totally untenable.

Because of disregard for agrotechnics, the hectare yields of clover have been unsatisfactory. In many enterprises they have been declining and the quality of forage has decreased, because clover and grass-mixtures--for want of a sufficient seed supply--have been grown for more years than is sound and profitable.

A large portion of clover is dried in stacks. This causes unbearable losses mainly of nutrients in dry clover and, in periods of unfavorable weather conditions, raises costs.

The portion of clover which in some enterprises is being fed as green fodder directly following the harvest is disproportionately high, while the fodder stock for the winter period is not supplied with a sufficient quantity of quality protein hay. Sizeable acreages of clover stubble still suitable for feeding, silaging, or grazing are left in the field unused.

9. Where meadows are concerned, the production of nutrients per unit of acreage of unsatisfactory yields per hectare is very low, and in comparison with the production of other main forage crops on plowland--with the exception of spring mixtures, is strongly below average. Low hectare yields are caused primarily by unregulated irrigation and water-conservation conditions, and by insufficient cultivation and manuring, mainly with composts. In some instances, particularly in enterprises with a large proportion of meadows, the grass crop is cut, for lack of a sufficient labor force or poor labor organization, only once during the season. In such enterprises, especially in the mountain and sub-mountain areas, the period of the first hay cutting lasts as a rule too long, which inadvertently leads to the overmaturing of grain and its spoilage.

The drying of hay on racks during unfavorable weather conditions, although used only to a very limited extent, is cheaper than drying it in stacks. Silaging, which in unfavorable climatic conditions helps speed up the harvest, reduces the losses of proteins in the process and prevents over-ripening while providing good conditions for second or third curring. It does not, on the whole, enjoy wide implementation. Indexes of production and profitableness show the advantageousness of the wide use of grass silage first of all in the mountain and sub-mountain areas where regular rainfalls greatly impede the drying.

Labor represented a decisive cost component in meadow harvests even more so than in the case of all other forage crops. Therefore stepping up the mechanization of this operation -- besides being a means to raise yields per hectare -- is one of the main requirements in making the production economical and increasing labor productivity in meadow work.

10. In sum, one can say that the production of nutrients per hectare (if no losses are incurred because of extraordinary circumstances, for example, the overmaturity of crops), the costs per unit of produced nutrients, and the productivity of labor -- with the same types of crops and the same yields per hectare -- are most favorable when using green fodder for feeding, in silaging and, finally in hay. It follows from this that the most economical of all is green fodder, and it is therefore of fundamental importance to insure the longest possible period of green-fodder feeding in order to reduce the costs of animal production as a whole.

In addition, it should be mentioned, however, that in the case of silage corn (grown as the main crop), which yielded the highest production of nutrients per hectare, the costs per unit of nutrients were lower than those of all forage crops used in direct feeding except grass and clover. This proves that feeding silage corn in the summer period is economically justified.

To silage, rather than dry, surplus green forage and especially mixtures is more economical. Forages unsuitable for silaging, such as clovers and meadow grasses, should be dried. If, however, forage should go bad because of the weather (especially in the mountain and sub-mountain areas) silaging is fully appropriate. Here, too, meadows should be taken care of first. Silage of green fodder augments the content of vitamins in the winter rations, since quality silage preserved almost all the carotene and vitamin C, while in hay cured by the common methods they are destroyed. It is therefore necessary to expect a much wider use of silaging both in clovers and meadows in particular (and also protein silage).

Summary Evaluation

The economic indexes of this study were computed after surveying the present actual state of economic activities. They reflect the situation as regards the fodder base and production conditions with all their positive and negative aspects at the level at which production finds itself at the present time. It is understandable that the gradual but continuous improvement of agrotechnics, mechanization, the organization of labor, etc., will assert its influence in increasing the economic effectiveness of forage crops. It is therefore not impossible that the present relations between individual crops will change, especially as regards the indexes of costs per unit of nutrients and labor productivity. This means that it is necessary to check systematically the economic effectiveness of forage crops within certain intervals so that the changes brought about by the development may

be observed and appropriate measures taken in good time. Most important, we must follow the new methods of complex mechanization in growing all types of crops -- primarily in harvesting operations; we must determine, on the basis of conclusions drawn from the practice, the methods best suited economically.

In order to have as exact an appraisal of individual forage crops as possible, especially in making a comparison between the various groups, it is necessary to take into account not only the losses incurred in storing but also the quantity of nutrients in seeds and seedlings as well as the acreage necessary for growing them. The produced quantity of nutrients is cut down by the volume of losses. These considerations are fully applicable when computing the basic economic indexes of the crops examined in Table XII. The average quantity of seeds used and the average losses suffered in silaging and storing fodders were taken as the basis in the examined enterprises. Based on this survey was the tabulation in Table XIII, which contains in separate groups (grain crops, root crops, and forage crops) the main forage and inter-crops together with succeeding crops (judged as a whole) according to the achieved production of nutrients per hectare and compared with the direct and total costs per 100 increased starch units and with the labor productivity.

Considering the crops which occupy a prominent place in all three indexes, the decisions as to the economic suitability of growing them presents no difficulty and involves only the examination of their extent. In regard to crops which at various operational stages have differentiated economic effectiveness, the decision is of course more difficult to make. In choosing forage crops it is necessary to proceed with caution while reconciling the selection with the available means and possibilities of the given agricultural enterprise. It must be remembered that the importance of individual indexes varies, and that it changes according to the needs and possibilities within the state and is also subject to the influence of international markets (for example, the possibility and suitability of import, etc.). Now that the first task is to increase agricultural production, special emphasis must be placed on the productive capacity of individual crops. Among other indexes profitableness is of ever greater importance and is expressed essentially by the indirect index in the form of direct and total costs converted into figures per unit of nutrients. This index is frequently also decisive in agricultural enterprises. Also connected with the necessity of cost reduction is the necessity of increasing labor productivity (in view of the relatively great insufficiency of the labor force in some enterprises), which depends on the mechanization of individual operations. Under the present state of mechanization some crops cannot of course be introduced on a larger scale, even though they have otherwise high productive capacity.

XII. THE RESULTING INDEXES OF THE ECONOMIC SUITABILITY OF GROWING ALL THE EXAMINED FORAGE CROPS

Crops	Yield per hectare	Production per hectare 1)					
		Total		After deducting losses 2)		Minus nutrients in seeds	
		starch units	increased starch units	starch units	increased starch units	starch units	increased starch units
Grain:							
Barley	22.61	2017	2262	1988	2230	1857	2080
Oats	17.81	1431	1644	1409	1620	1295	1486
Corn	28.02	3386	3775	3135	3502	3096	3458
Legumes	12.28	1185	1506	1166	1483	1033	1313
Root crops:							
Potatoes	172.12	3098	3356	2726	2953	2211	2395
Fodder beets	452.87	4057	4482	3521	3889	3440	3799
Sugar beets	337.56	5883	6377	5111	5540	4993	5412
Forage -- silaged:							
Silage corn (containing 11% starch units)	496.23	5459	6004	4367	4803	4312	4741
Green-fodder corn -- silage	288.61	2309	2569	1847	2055	1711	1901
Winter mixtures	179.43	1884	2315	1507	1852	1379	1689
Spring mixtures	180.33	1443	1930	1155	1544	1028	1384
Forage -- green fodder:							
Winter mixtures	192.12	2017	2478	2017	2478	1889	2315
Spring mixtures	161.22	1290	1725	1290	1725	1163	1565
Summer mixtures	127.62	1021	1366	1021	1366	892	1206
Green-fodder corn	288.61	2309	2569	2309	2569	2173	2415

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[adjoins page 70 here]

[adjoins page 68 here]

Crops	Yield per hectare	Production per hectare 1)					
		Total		After deducting losses 2)		Minus nutrients in seeds	
		starch units	increased starch units	starch units	increased starch units	starch units	increased starch units
Fodder cabbage	412.38	3299	4041	3299	4041	3266	4001
Clovers	194.75	2240	2785	2240	2785	2195	2729
Grass	135.87	1698	2011	1698	2011	1698	2011
Winter mixtures and corn							
Green fodder	480.73	4326	5047	4326	5047	4062	4730
Winter and summer mixtures	319.74	3038	3844	3038	3844	2781	3521
Forages -- hay							
Mixtures	33.77	1031	1266	932	1165	804	1004
Clovers	44.55	1403	1862	1291	1713	1246	1657
Meadows	31.75	1047	1238	963	1139	963	1139

1) Including nutrients in by-products
2) In storing or fermentation
3) Approx. 3/4 cut manually

[adjoins page 71 here]

[Adjoins page 68 here]

Crops	Costs in kcs per 100 increased starch units: Direct	Costs in kcs per 100 increased starch units: Total	Production of increased starch units per 100 manual hours	Costs in kcs per hectare: Direct	Costs in kcs per hectare: Total
	After deductions of losses 2)				
Grain:					
Barley	69	109	1869	1543	2435
Oats	76	119	1696	1224	1929
Corn	81	123	935	2844	4314
Legumes	83	121	1714	1227	1793
Root crops:					
Potatoes	159	245	725	4694	7244
Fodder beets	132	221	548	5124	8600
Sugar beets	94	161	960	5226	8895
Forage -- silaged:					
Silage corn (containing 11% starch units)	55	80	1934	2650	3863
Green-fodder corn -- silage	91	136	1106	1864	2793
Winter mixtures	91	124	1342	1684	2294
Spring mixtures	102	158	1108	1582	2439
Forage -- green fodder:					
Winter mixtures	56	75	2815	1380	1854
Spring mixtures	72	99	2078	1238	1702
Summer mixtures	86	114	1749	1181	1556
Green-fodder corn	64	89	2159	1650	2296

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Crops	Costs in kcs per 100 increased starch units — Direct	Costs in kcs per 100 increased starch units — Total	Production of increased starch units per 100 manual hours	Costs in kcs per hectare — Direct	Costs in kcs per hectare — Total
	After deductions of losses 2)				
Fodder cabbage	117	194	678	4722	7835
Clovers	38	55	4107	1057	1518
Grass	51	79	1428 3)	1021	1580
Winter mixtures and Corn					
Green fodder	60	82	2438	3030	4150
Winter and summer mixtures	67	89	2314	2561	3410
Forages -- hay					
Mixtures	120	167	1122	1399	1944
Clovers	65	100	1813	1120	1717
Meadows	82	140	967	933	1589

[adjoins page 69 here]

XIII. COMPARISON ON BASIC ECONOMIC INDEXES AS REGARDS THE EXAMINED CROPS (WHERE COSTS AND LABOR PRODUCTIVITY ARE CONCERNED -- AFTER DEDUCTING LOSSES DUE TO STORING AND SILAGING; IN THE CASE OF PRODUCTION -- ALSO NUTRIENTS IN SEEDS ARE INCLUDED)

Crop	Production of starch units per hectare		Costs per 100 increased starch units				Production of increased starch units per 100 manual hours	
			direct		total			
	Kcs	Sequence	Kcs	Sequence	Kcs	Sequence	Kg	Sequence
Grain crops:								
Corn	3096	1	81	3	123	4	935	4
Barley	1857	2	69	1	109	1	1869	1
Oats	1295	3	76	2	119	2	1696	3
Legumes	1033	4	83	4	121	3	1714	2
Root crops:								
Sugar beets	4993	1	94	1	161	1	960	1
Fodder beets	3440	2	132	2	221	2	548	3
Potatoes	2211	3	159	3	245	3	725	2
Hay and silage of forage crops:								
Silage corn	4312	1	55	1	80	1	1934	1
Winter mixtures and corn -- both silaged	3090	2	91	4	130	3	1207	3
Clover hay	1246	3	65	2	100	2	1813	2
Spring mixture-silaged	1028	4	102	5	158	5	1108	5
Meadows -- dry forage	963	5	82	3	140	4	967	6
Mixture -- dry forage	804	6	120	6	167	6	1122	4

[adjoins page 73 here]

[adjoins page 72 here]

Crop	Production of starch units per hectare		Costs per 100 increased starch units				Production of increased starch units per 100 manual hours	
			direct		total			
	Kcs	Sequence	Kcs	Sequence	Kcs	Sequence	Kg	Sequence
Green forage:								
Winter mixture and green fodder corn	4062	1	60	3	82	3	2438	2
Fodder cabbage	3266	2	117	6	194	6	678	6
Winter and summer mixtures	2781	3	67	4	89	4	2314	3
Clovers	2195	4	38	1	55	1	4107	1
Meadows -- grass	1698	5	51	2	79	2	1428[1)]	5
Spring mixtures	1163	6	72	5	99	5	2078	4

1) Approx. 3/4 cut manually

From the comparison of the individual forage crops of all three groups we see that the highest production of nutrients per hectare was achieved with sugar beets considered exclusively as a forage crop. After deducting the losses due to storing the beet roots and silaging the tops, and after taking into account the acreage necessary for growing seeds, the production per hectare amounted to 4,993 starch units. Then follows silage corn, which yielded with the nutrients in the seeds used, after deducting the losses due to silaging, 4,312 starch units. A great quantity of nutrients per hectare was obtained also in growing winter mixtures together with the succeeding crops of green-fodder corn (4,062 starch units when used directly for feeding, and 3,090 starch units when silaged); with fodder beets (3,440 starch units); with fodder cabbage (3,266 starch units); winter and summer green mixtures -- also judged together -- (2,781 starch units); with clover -- even at relatively low yields per hectare (2,195 starch units); etc.

The production of nutrients was low in legume seeds, meadows, and especially spring mixtures used as dry and green forage.

In the production of proteins per hectare good results were attained not only with protein-rich fodders, such as clover, fodder cabbage, mixtures, etc., but also -- as a result of exceptional productive capacity -- with some carbohydrate fodders such as silage corn, sugar beets, and others. Out of the total quantity, the proportion of nutrients is even here, of course, low. Speaking of digestible proteins, it is necessary to take into account not only the absolute quantity of proteins obtained per unit of land, but also their proportion to starch units, since the higher the proportion of digestible proteins the more suitable and usable the fodder usually is.

In respect to costs per unit of produced nutrients, in the case of coarse fodders, which are primarily intended for the winter seasons, they were lower with silage than with clover and meadows even at relatively low yields per hectare. The cost per 100 increased starch units in silage corn amounted to only 55 kcs, in clover hay to 82 kcs; while in the silage of spring mixtures, it amounted to 102 kcs, in dry fodder mixtures to 120 kcs, in fodder beets to 132 kcs, and in potatoes to 159 kcs. In the case of green forage the cost per 100 increased starch units amounted to 38 kcs with clover, 51 kcs with meadow grass, 67 kcs in direct costs with winter and summer mixtures, and 72 kcs with spring mixtures. In the category of grain crops, the cheapest was the production of nutrients from barley (69 kcs); the most expensive, legumes (83 kcs) and corn (81 kcs).

In the productivity of labor as it pertains to coarse fodders primarily designed for winter feeding, i.e., hay, silage, and beet roots, silage corn is first with a production of 1,934 increased starch units. After silage corn comes dry-fodder clover per 100 man-hours (1,813 increased starch units), the silage of winter mixtures and green-fodder corn (1,207 increased starch units), etc., while at the end of the list come spring silage mixtures (1,108 increased starch units), dry-fodder mixtures (1,122 increased starch units), and all the root crops (fodder beets only 548 increased starch units). As regards green fodder used for direct feeding, the highest labor productivity was achieved with clovers (4,107 increased starch units), winter mixtures together with green-fodder corn (2,438 increased starch units), and winter and summer mixtures (2,314 increased starch units). The lowest labor productivity was achieved with fodder cabbage (678 increased starch units). In the category of grain crops, labor productivity was highest with barley (1,869 increased starch units) and lowest with seed corn (935 increased starch units).

The big differences between individual enterprises -- even in the same production areas -- particularly as relates to yields and costs per hectare of crops (and thus of nutrients) and labor productivity, reveal what great resources exist for increasing production while lowering the costs of fodders. It was found, as a matter of fact, that some crops with low productive capacity, high production costs, and low labor productivity were frequently grown on a wider scale, while some highly effective forage crops were unjustifiably neglected. Once these resources are put to work, a substantial increase and greater economy in over-all agricultural production will be effected, which will significantly contribute toward raising the standard of living of the population of our state.

Proposed Measures

Several conclusions and proposals which follow from the foregoing analysis are mentioned in the appropriate parts of this study. In substance it can be said that the activity in our agricultural production should be concentrated first of all on the following measures:

1. To extend, in view of its high productive capacity, the growing of green-fodder corn to areas where at the present level of cultivation techniques it will provide approximately 5 to 8 more quintals per hectare than barley, specifically in the corn-growing area and in the warmer and drier beet-growing area, with a concurrent speedy introduction of the effective mechanization of cultivation and harvesting operations.

2. To increase in all the Republic of Czechoslovakia, mainly in the cooperative sector, the average proportion of areas sown with legume mixtures for seed, the yields of which under our conditions are more assured than those of pure legume crops; and to increase under suitable natural and economic conditions the proportion of beans.

3. To radically remove the defects in growing potatoes which are causing a continuous lag in the growth of hectare yields. This concerns first of all cultivation, the wider use of potato hybrids with high feed value, the full application of the mechanized implements which are now in use, especially the potato-planting machine and the harvest combines which are being tested in our country. To put them speedily to practical use. If adequate soil conditions permit, to sow with sugar beets a part of the acreage intended for fodder potatoes.

4. To speed up the hybridization of suitable fodder and sugar-beet seed, at the same time insuring and expanding their cultivation at the expense of fodder beets; the same applies in the potato-growing areas where deeper top soil prevails, replacing potatoes with sugar beets, since these, considered as a forage crop, are the most productive of all crops.

5. To expand the acreage of winter mixtures in all production areas (except the mountain area). Winter mixtures together with the succeeding summer mixtures, especially when they contain a higher proportion of corn and have green-fodder corn as the aftercrop, provide a high quantity of nutrients at average costs and labor productivity.

6. To increase in all areas -- except the mountain areas -- the proportion of acreages sown with silage corn, first of all by replacing the spring mixtures and fodder beets. To do more square-hill sowing, to insure timely sowing and the necessary cultivation.

7. To solve the mechanization problem of such a highly productive crop as fodder cabbage (its cultivation and harvesting) by assuring that mechanized tools and implements are available in the individual enterprises (thinning and silage machines and combines). To expand the acreage of fodder cabbage, especially in those enterprises having sufficient manpower and suitable natural and economic conditions (a sufficient number of cattle, a sufficient quantity of manure, etc.).

8. To increase substantially in all areas the acreage sown with clovers as the most important forage crop (for an especially important item of animal production--beef cattle). To insist that all enterprises grow at least such a quantity of seeds as meets their own needs.

9. To reduce the acreage sown with spring mixtures to what is necessary to insure the continuity of the green fodder supply at the end of the spring and beginning of the summer seasons. The growing of such crops for hay is then economically absolutely unjustified. Surpluses of mixtures (including winter crops) should be silaged instead of being dried, since silaging is economically a more suitable method of curing, especially in respect to costs and labor productivity.

10. To convert gradually and on a planned basis the meadows (and pastures) into plowland wherever technical and economic conditions permit. To do considerably more silaging of grasses under the unfavorable climatic conditions of the mountain and sub-mountain areas. To implement new technological methods of harvesting meadow grass on a larger scale wherever possible, to evaluate these methods systematically in economic terms, and to insure their wide application.

11. To prolong the period of green feeding for as long as possible during the season, and to add to the feeding ration, according to the needs, suitable silage and, above all, corn. To increase greatly the production of silage and to see that it be widely used for feeding during the winter period. To compensate for the reduced volume of hay consumption in this period by increasing its quality.

CSO: 3694-D

II. SOLVING PROBLEMS OF AGRICULTURAL PRODUCTION IN THE TERRITORIAL PLANS

[Following is a translation of an article taken from the Czechoslovak periodical Zemedelska ekonomika (Agricultural Economics), Prague, Vol. 6 (XXXIII), No. 1, January 1960. Authors and inclusive page numbers are given below. Pages 58-60 have been omitted.]

Pages 43-57; 61-62

Jindrich Minarik

Introduction

Agricultural production under socialism is regulated according to plans and on a scientific basis. One of the requisites of the planned regulation of agricultural production is its proper connection with other branches of production and nonproduction activities within each area. A qualitatively improved and harmoniously balanced territorial unit may be established only on the basis of a correct combination of these factors.

The development of agricultural production -- one of the main branches of the national economy -- is a very serious question in territorial planning. Agricultural production consists, however, not only of vegetable and animal production, it extends also to other forms of production and includes the distribution of needed agricultural services, the distribution of the labor force throughout agriculture, etc. Only by solving all of these questions will it be possible to put agricultural production on a truly planned basis and to create realistic conditions for its development by placing construction projects in the most rational locations, by putting the labor force where it is needed, by expanding mechanization, and the like. This means that the advance and growth of collective and state farms as well as of other farms and sub-sections, cannot be insured without the coordination of broader interrelationships within a territory. The development and growth of agricultural production cannot, therefore, be approached and handled from the point of view of one single district or the economic range of one individual community, but must be correlated with broader territorial plans.

In districts where plans have already been drawn up, further organizational aspects of agricultural production will be much easier to solve, since these plans will help in making sound decisions as to the locations of investment construction projects in accordance with the conditions of the given territory.

The Place of Agriculture in the Territorial Plans

Agriculture does not carry equal weight in all territorial plans. The place of agriculture in the territorial plan depends first of all on consideration of the nature of this plan. As a rule, agricultural production is of lesser significance in directive territorial plans than, for example, in area plans. The place of agriculture depends, however, even more expressedly on the direction of the tasks set before it, on the goal which it pursues in a particular case. There are territorial plans in which agricultural production occupies the primary place. This is the case in the intensive agricultural areas where agricultural production is the main factor; such is the case, for example, in the district plan of Southern Moravia or -- if we also consider at the same time the great importance of the industry -- in the plans of the majority of okreses adjacent to the border. In other territorial plans, such as the district territorial plan of the Southern Moravia lignite basin, agriculture belongs to the main factors which are here industry, agriculture, and water economy. The nature of other tasks may move agriculture into the background so that it may become a supplementary factor, as is true, for instance, in the district territorial plan of the Sokolov-Cheb basin, etc.

The place of agriculture in the territorial plans is responsible for the scope of the agricultural problems which must be coped with. The content of the work of the various agricultural sectors changes with every new task, since the individual areas which are subject to elaboration in the territorial plans have not only distinct problems but deficiencies as well, their previous results and future possibilities vary, and their connections with other sectors are of a diverse nature.

Among the territorial plans the most important is the district plan. As of now, district plans have been worked out in the following areas:

1. The mining areas (for example, Most, Sokolovo and Ostrava).
2. Areas of water supply and hydro-energetics construction projects (Moldau cascades, the electric power plants of Melnik, and others).
3. Areas adjacent to and surrounding cities (for example, the capital city of Prague).
4. Resort areas (for instance, the High Tatra, Krkonose, etc.).
5. Intensive agricultural areas (Southern Moravia, Potiska lowland).
6. Border areas.

Agricultural production in the mining areas is continually affected by the development of coal and ore mining. This situation must necessarily be kept in mind in dealing with agricultural production. First of all, the limits of the land under cultivation should be fixed and the main direction of agricultural-production expansion in relation to the extent of coal mining should be determined, in order to insure the population of industrial centers a supply of some biologically nutritive products (milk, vegetables, etc.). At the same time, it should be remembered that mining affects hydrological conditions (the level of subsurface and ground water) and that a sufficient water supply in agricultural areas will have to be provided. The distribution of production units and agricultural services in the vicinity of mining areas is very important in insuring the cultivation of all agricultural land. At the same time, it is necessary that the nature of construction in these areas be determined, and that areas where agricultural construction is not recommended be specified. Very important is the solution of the problem of manpower in agriculture, since the majority of workers prefer employment in industry. Besides that, it is imperative that the health conditions of areas which have been affected by industrial activities be improved, for example, by planting fruit trees. And though on the one hand such areas are threatened by ashes and smoke contamination, the excess heat energy from the nearby industry, especially the thermal power plants, can be put to use.

These are just a few of the main questions which must be solved in the agricultural sector in the areas of coal mining and mineral extraction. One more thought should be added: in these areas it is not the actual mining area that creates a problem, but the adjoining areas, which are vital from the point of view of supplying the industrial population with agricultural products, especially produce that is marketed and consumed while still fresh.

In drawing up the district plans of water-supply and hydro-energetic construction (water dams, hydroelectric power plants) we concentrate our attention first of all on the evaluation, from the agricultural point of view, of lands to be flooded:

a. the district in the area which will be affected;

b. the communities which will be flooded and the number of agricultural workers that will have to be resettled;

c. how much agricultural land will be lost and the extent of the intensiveness of agricultural production on it;

d. the value of the investments lost.

As soon as these questions have been answered, the organization of agricultural production in the vicinity of the water dam must be considered and a proposal for the establishment of a

production unit to take over the cultivation of the remaining agricultural land must be worked out. Proposals for the relocation of the population from the flooded villages to other areas is closely tied in with such plans. Further, it is necessary to plan a method for the use of ponds for agricultural purposes (irrigation, system of liquid manuring, etc.).

In drawing up plans for these areas, they must be tied in with the larger territories, for example:

a. the extent of erosion affecting the purity of water in water dam reservoirs must be established;

b. in the case of drinking-water reservoirs, a method of cultivation of agricultural lands must be devised for the use of hygienic zones I and II; at the same time, it is necessary to work out figures on the investment costs expended for the preservation and protection of the tributary streams flowing into the dam reservoir;

c. the fields which are to be irrigated from the nearby water storage must be surveyed and studied.

In examining the territory where the construction of an electric power plant is being planned, the dangerous effect of ashes and smoke on agricultural production must be taken into consideration and analyzed according to the degree of danger, at the same time weighing the possibility of using the surplus heat energy, for example, for hothouses.

In making plans for areas close to and adjoining city limits, it is necessary, in the agricultural sector, to focus attention mainly on the production of such products as spoil or go bad when transported or stored and on products the transportation of which is uneconomical. In other words, the supply of city populations with high-quality fresh vegetables, fruit, milk, and eggs or other products must be insured. Then of course it is important that this specialized orientation be closely linked with the other aspects of agricultural production, especially in securing a sufficient raw-material base for the food industry)sugar refineries, dairies, etc.) Questions directly connected with agriculture in areas next to and surrounding cities must be accorded special attention: irrigation, utilization of city sewage and dumps. City suburbs -- and the agricultural produce they deliver -- are treated as independent tasks (as, for example, the Prague suburbs). But the question of supplying the cities with fresh farm produce, that is, the problem of agricultural production which has developed close to city limits, may often be included as a part of other territorial plans if in the area there is a city or an agglomaration of cities which warrant this action. A characteristic example is the preparation of the district plan of the Ostrava-Karvina basin.

In regard to resort areas it is most important to provide for the right sort of agricultural orientation and supply of fresh agricultural produce. The production orientation is examined only in the actual resort area. The supply of the population with fresh produce can, however, go well beyond the limits of the resort area itself. This depends particularly on the size of the resort area and on the average number of vacationers; furthermore, on the natural and economic conditions of agricultural production located directly within the boundaries of the resort area and its nearest vicinity (the mountain areas or intensive agricultural areas with highly developed vegetable production, dairies, etc.). Frequently it is useful to examine whether or not it may be more worthwhile to rely on the more distant specialized areas than to introduce new varieties in nearby areas.

Of greatest importance in the intensive-agriculture areas is the district plan, which is concerned with the typical and special crops of the individual agricultural sectors (vineyards, vegetables, tobacco, etc.), with possibilities for irrigation, etc. Solution of the complex and technical problems of the territory, of water economy, the biological conditions of the region, and a calculation of the major investment plans as the main content of these territorial district plans are required.

The first task of the agricultural sector is to ascertain on the basis of an analysis of the existing orientations and the character of agricultural production the extent to which the natural and economic conditions are being used, the possibilities of specialization, irrigation, etc. Evaluated together with this are hydroeconomic, climatic, and biological factors, their influence on agricultural production, as well as the most advantageous use of these factors (irrigation and drainage, for instance) in increasing the intensity of agricultural production.

All the proposed measures in the territories are subordinated to the needs of developing agricultural production as the main link. Closely connected with agricultural production is the solution of hydroeconomic questions, and first of all of irrigation. The planning of projects and the evaluation of the importance of the successive stages of construction are worked out in cooperation with the hydroeconomic sector. Equally important is collaboration with the food industry. Keeping in close touch with the biological studies and findings of the region is important in territories where biological conditions are endangered by erosion and other phenomena.

Promotion of the intensification of agricultural production, which was made possible by a number of measures, will in the future undoubtedly also influence the solution of employment problems

in agriculture. The questions of the availability of manpower in the districts and the conclusions which may be drawn therefrom must receive attention in connection with this.

In these areas the extent of agricultural lands and hydro-economic problems are the decisive factors in fixing the boundaries of the agricultural districts.

Border areas may not be directly included in the actual district plans because these territories are demarcated by the administrative boundaries of the individual okreses. This is one of the methods of district planning. The earlier experiences show that the completion of the resettlement in areas adjacent to the border will not in itself solve the problem of agricultural production in these areas, but that a solution of all other related questions is imperative in creating favorable living conditions. It cannot be assumed that all new settlers will be employed in agriculture. It is therefore necessary to provide other working opportunities, particularly by making provision for adequate services, cultural life, etc. The solution of agricultural problems still remains the outstanding issue.

In the agricultural sector we concentrate on evaluating to what extent the natural conditions, the land fund and its division according to sectors, the orientation of vegetable and animal production, the possibilities of specialization, the questions of manpower, and investment construction have been most advantageously utilized. In working out future plans, attention must be centered on the relations between the orientation of agricultural production -- the labor force -- and investments, as well as on the relations between agricultural production as a whole and other production sectors.

Of greatest importance is the elaboration of district territorial plans. For the sake of completeness, we shall, also mention the place of agriculture in the directive plans.

In the directive plans the objectives of agricultural production are worked out on a relatively small scale. Directive plans comprise only a few districts in which agricultural production is briefly appraised. The proposed measures set the extent of the land fund, and the acreage for intensive crop cultivation; the required capacity of economic buildings is calculated on the basis of proposed vegetable and animal production, and the location of these buildings is thus determined. In other localities questions of amelioration, of the negative influence of industrial activity on agriculture (dust from cement works, density of smoke and fumes, etc.), are dealt with as the needs may dictate.

The Basic Methodological Procedure and the Work Content

Even though the problems of almost every task are different, it is nevertheless possible to generalize, to some degree, the main methodological principles and the actual content of the work at the various working stages in the territorial plans. It should be pointed out, however, that not all of the questions mentioned here are incorporated in every single territorial plan and that this examination is concerned only with the general content of the work.

The elaboration of territorial plans -- and this includes the agricultural sector -- is carried out essentially in three working stages: analysis, draft proposal, and final proposal.

The actual analysis is preceded by the inventory. At this stage it is necessary to get acquainted with the terrain on the map and on the spot, in order to gain in this way first-hand information and learn about the pertinent facts of the territory. Furthermore, it is necessary to gather, through study and examination -- or, if need be, to supplement with further research -- the available information which may help with the task. This concerns a variety of statistical and map material and the results of the research of the Czechoslovak Academy of Agricultural Sciences; the State Institute of Standards and the Development of Agricultural Construction; the Directory for the Construction, Development, and Administration of Hydroeconomic Projects; the material of the regional institutes of geodesy and cartography; the Governmental Committee for the Improvement of Agriculture, Forestry and Water Economy; etc.

The available statistical material, be it located at the State Statistical Office and its subsidiaries or at the regional and okres national committees, must be collected and processed. Further assembled are the data on stable and silage space, the fodder situation, the state of agricultural services, bulk purchases of agricultural products, etc. Important in the preparation of prospective production plans and the investment needs connected therewith is the material showing the degree of the depletion and deterioration of land, especially in the coal- and ore-mining areas; the influence of air pollution on agricultural vegetation; the state of agricultural investments; the development of socialization; and the extent of the land fund and its distribution between the collective and state farms. The collected and examined material must be thoroughly reviewed and evaluated.

The above-mentioned material is not only useful for restricted local purposes, it may also be applied to wider areas (mostly it concerns the kraj territory). This includes primarily statistical and cartographic material. Among the various cartographic materials

especially useful are land maps, material on types of production and their subdivisions, meteorological and hydroeconomic materials (especially of flood, irrigation, and drainage areas), material on the delimitation of the land fund, the feasibility of mechanization, etc.

On the basis of this collected and examined material a work outline is prepared which lists the main problems of the given territory. To insure the maximum precision and exactness the plan is written up in consultation with the main planner, the workers of the kraj and okres national committees, and the other agencies involved. Then follows the next phase of work -- the analysis.

The analysis of agricultural production is divided essentially into four main categories:

a. National conditions: soil, meteorological, hydroeconomic conditions, and erosion;

b. Technical production conditions: land resources, vegetable and animal production and their interconnection (the situation as regards fodder and barnyard manure), specialization in vegetable and animal production;

c. Economic production conditions: division into branches, agricultural services, mechanization equipment, labor force, supply of needs for main agricultural products, investment construction;

d. Territorial and economic appraisal: production areas and their subdivisions; the value of gross and market agricultural production, and the effectiveness of investments.

The draft proposal constitutes the framework of the later final version of the proposal on agricultural production in the territory and the rough features of the basic prospective evaluation which will correct and adjust it. Roughly, it is divided into three parts: the production proposal, its fulfillment (balance forms the main part of it), a territorial and economic evaluation of the proposal.

Plans for the fulfillment of the proposal and the balance are worked out for the individual stages. These are worked out up to the years 1960-65 and 1975, in some cases including the elaboration of long-term plans.

The draft proposal therefore contains the main principles of the development of vegetable and animal production and especially of special crops. The level of the production indexes is projected into the territorial plans and is coordinated with other production factors. Simultaneously, new suggestions for territorial organization may be made from the standpoint of agriculture; for example, in mining districts where no production units had previously been located lands are being delimited and appropriate measures

for their cultivation are being offered. These organizational-territorial proposals are subsequently adjusted and coordinated with other branches, notably the urban sector, the sectors of transportation, industry and water economy.

Estimates and computations are always made for the land fund, the labor force, and investments. In working out the calculation regarding the land fund, both the statistical material on the extent of the land fund and the data of other sectors concerning the reduction of agricultural and arable land are used. In elaborating the problem of the labor force, the expected manpower needs of agriculture are estimated and fixed, and this may later result either in a surplus or shortage of labor power. This calculation is based on production indexes. The investment proposal appraises the planned investment projects. Should investment plans not be available, the investment requests are considered on the basis of the production indexes, taking into account the practical possibilities.

At this point various calculations for other sectors, for instance, the supply of water for agricultural purposes, the electric-power need of agriculture, raw material for the food industry, are made. Further ascertained are the possibilities of making the best possible use of surplus heat energy, while the harmful consequences of some plans which may adversely affect agricultural production are pointed out.

The final proposal is a more exact version of the earlier draft proposal drawn up on the basis of the comments of the ministries and central offices, kraj and okres national committees, and other agencies.

After completing the orientation survey of the basic methodological procedure, we shall note the content of the most important component parts of the plan, an evaluation of which is indispensable in providing the right solution for the agricultural production problems in the territorial plans.

Natural Conditions

The fundamental condition of the correct distribution of agricultural production is the most advantageous utilization of the most suitable natural and economic conditions. First among the natural conditions are soil and meteorological conditions; these must receive the utmost consideration in territorial planning and especially in the zoning of agricultural production. It is by no means improbable that the interests of the development of the national economy, as expressed in the state plan, may ask for a wider cultivation of less suitable crops, for example, the cultivation

of sugar beets in zone of suitability III. This, however, changes nothing as regards the fact that agriculture can attain the highest possible production only if the best use of the given natural conditions is made possible. The degree of this use is, however, conditioned by the intensity and the over-all organization of agricultural production.

The main crops (corn, beets, potatoes, mountain farming) and the accompanying crops (for example, potatoes-rye, potatoes-barley, potatoes-wheat, potatoes-oats) need the right combination of soil and weather conditions if good results are to be achieved.

To a certain extent they are to guide the production orientation (the state plan is decisive). Charts of typical crops and other lesser but standard crop varieties represent -- together with the inclusion of villages in the production areas in the new system of bulk purchases and prices -- the basic material in computing the district plans and in working out the arrangement of agricultural-production areas.

For the examination and evaluation of soil conditions, use is made of the charts prepared by the Research Institute of Agricultural Economics of the Czechoslovak Academy of Sciences, the soil maps put out by the State Hydroeconomic Plan, or other pedological maps expertly drawn in the various areas. From the pedological maps we gain a general idea as to the quality of soil (black soil) and as to soils least suitable for agriculture (light soil or sand drifts). Soil of good quality must be protected by all available means from deterioration; where deterioration would seem inescapable, measures must be taken to prevent the loss of the top layer. Furthermore, pedological data are used to appraise the possibilities of growing certain special crops and methods of irrigation, to examine and mark lands susceptible to erosion, to draw up some preliminary figures covering fertilizer expenses (liming the soil if this should be the case), etc.

Along with soil conditions the climatic conditions of the given territory must also be considered. This is necessary especially in cultivating special crops (Southern Moravia), in which case it is essential to consider local climate conditions and in exceptional cases, the climatic conditions of individual localities.

The evaluation of climatic conditions as related to and affects agricultural production is the task of the climatological sector. Average temperatures and precipitation for the whole year, and especially during the period of vegetation, are recorded and examined over a period of many years. The evaluation of wind direction and velocity is of special importance in areas of wind-erosion hazards and in places exposed to air pollution due to industrial activity (ashes, smoke, exhaust fumes). Secondly, the prevailing direction of air masses is very important not only from the agricultural but also the urban point of view.

The degree of elevation above sea level, the horizontal structure of the terrain, etc., must not be overlooked. The profile of the terrain, especially in its relation to other factors of the territory, exerts much influence on determining the main peculiarities of the local climate.

It should be emphasized, however, that the possibilities of the purposeful exploitation of natural conditions is to be appraised not only from the technical-production but also economic standpoint.

Hydroeconomic conditions call for special attention. Flood areas must be considered in order to determine the extent of damage caused by them. The extent of irrigation and drainage, flooded fields and their amelioration, the level of subsurface water (for example, the possibility of using field wells for irrigation), the system of ponds and lakes, etc. -- all these are a part of the main issue to which we give our attention. At the same time, the purity of the water of individual streams is examined with a view toward using it for agricultural purposes. This is important especially in such industrial areas as the kraj of Usti nad Labem (the Bilina River has probably the highest pollution rate in all of Central Europe), in the vicinity of Ostrava, Prague and other cities. Hydroeconomic conditions are evaluated in connection with the hydroeconomic sector.

A large portion of the data is obtained from the State Hydroeconomic Plan and the Directorate for the Construction, Development, and Administration of Hydroeconomic Works (formerly VRIS); data on the extent of flooded fields are obtained from the okres national committees; other data frequently may be obtained by means of individual research. All lake and pond systems, flood areas, irrigation and drainage systems, are recorded cartographically. In solving hydroeconomic problems it is often necessary to deal with areas much wider than the area delimited by the district.

In some areas special attention must be accorded to run-off (fluvial) and wind (aeolian) erosion; for example, water erosion especially in the Bohemian Stredohori, the border areas, and in Slovakia; wind erosion in Southern Moravia. Water erosion is a common occurrence at an incline of more than 2° in the case of lighter soil, and sometimes even at a lesser incline if a higher slope lies above this area with a large amount of accumulated rain waters. This water erosion, however, is not strong. If the sloping is steeper, some special measures must be taken to prevent erosion, for example, terrace or contour plowing. Areas of more than 10° in incline are much in need of protection from erosion. Otherwise there is danger of the top layer of arable soil being washed away, and consequently the threat of soil deterioration. Soil of light sand-dust composition suffers most from wind erosion. Wind erosion rarely occurs in our country.

The problems of water and wind erosion are studied along with the biology of the region and in close association with agricultural production. Areas threatened or affected by water erosion are marked on maps which also show areas where antierosion protection is needed (1/3, 1/2, etc., of the soil layer). By checking the exposed area on the maps and marrkng the limits of land funds, areas which must be protected from erosion, at least by agrotechnical measures (for example, by contour plowing), are indicated. Areas of wind erosion, however, are examined only for orientation purposes. Problems of water and wind erosion were studied in connection with the district plan of Southern Moravia and the district plan of the South Moravian lignite basin.

Land Fund

In examining the natural conditions suited for agricultural production, attention must be focused on the basic factor of production in agriculture -- land. Firstly, based on the data of the land cadastre, it is necessary to determine the decrease of agricultural and arable lands. In the absence of any other comparable material, the information covering the period 1937-55 of the Central Administration of Geodesy and Cartography, or of their regional institutes and survey centers, is used. In this way it is possible to establish the extent of the area where agricultural production is seriously losing its economic foundation, and to propose measures which would seem appropriate in this connection. This survey will reveal the reserves of arable and agricultural land.

The examination of individual types of crops is conducted according to agricultural areas on the basis of the data of the Central Administration of Geodesy and Cartography and its subordinated agencies, always as of 31 December. The representation of individual crops within the agricultural lands and their total acreage; the soil resources, that is, meadows and pastures and their proportions; as well as other special crops (hop fields, vineyards, orchards) and the acreage of fallow land, are ascertained. This examination is carried out in districts, krajs, and okreses, and sometimes also in individual communities; according to need, some data on the composition of the land fund are established for individual production sectors, too. The mentioned analyses are accompanied by charts, cartograms, and maps. The analysis of crop types serves mainly these purposes:

a. to determine the extent of areas with a high proportion of arable land and special crops;

b. to determine the extent of pasture lands which are of substantial importance as regards the structure of animal production;

c. to determine the possibilities of developing the fodder base, especially as concerns coarse forage;

d. to appraise the possibilities of expanding agricultural and arable lands.

In some areas exceptionally great attention is devoted to soil resources. The appraisal of the soil fund is primarily focused on determining the quality of individual grass varieties (the proportion between wild and cultivated grasses), on the hydroeconomic conditions of meadows and pastures, on the possibilities of terrain development and other conditions, on the mechanization of harvest operations, and on the possibilities of increasing the total crop. The background material for this appraisal is concentrated mostly at individual okres national committees.

Recultivation

In areas where extensive mining operations are carried out, where the plants of various branches of heavy industry (chemical plants, foundries, power and engineering plants) and light industry are located, and where at the same time housing, private, and other construction is in progress, large tracts of land -- mostly agricultural land -- undergo deterioration and devastation. Besides that, there is great pollution of air and water. This causes great economic damage and seriously endangers the biological life of the region, adversely affecting hygienic conditions in particular.

In view of the expected fast pace of development in extraction, coal, and other industrial production, these negative influences will continue to grow in the future. The district plans of such areas as Ostrava, Most, and Sokolovo must include provisions for solving the questions of the sanitation and recultivation of the territory.

Under sanitation we understand such restoration of the affected area (land, water, air) as would return it to normal social use. Recultivation is a part of sanitation. In essence it is cultivation of the disturbed surface. Recultivation of the polluted and devastated areas is the task of the agricultural sector. In the mining areas these projects, so far as their significance is concerned, are among the most important questions of the territorial plan.

First of all, it is necessary to study the present and estimate the future extent of the devastated areas, and to find out if it may not be possible to arrest by means of preventive timely adjustment and local arrangements of the projects the expected reduction of agricultural lands. There being the possibility of deciding the alternate directions of the further expansion and

ramification of mining fields, it is very important to estimate which alternative will cause lesser losses in agricultural production. Since land is the basic means of production in agriculture, its protection is the primary task, and it is all the more important because the extent of available agricultural and arable lands is continually decreasing. In Czechoslovakia the acreage of arable land declined in the years 1937-55 by 10.8%, the acreage of agricultural lands by 6%. In the Ostrava and Karvina okreses in the same period, 29% of arable and 16% of agricultural land was lost. Similar was the situation in the areas of Most and Sokolovo. Agricultural lands suffer decreases due to agricultural and industrial investment construction, civic and tenant housing development, the construction of water dams, and military needs. All these constructions are frequently carried out on a scale larger than the needs require. A substantial factor which has contributed toward the decrease of agricultural land, insignificant on the statewide scale but substantial in the areas of Ostrava, Most, and Sokolovo, is the extensive devastations brought about by the mining of coal, kaolin, and other minerals.

Devastated land in the industrial areas and particularly in the mining areas can be divided basically into these groups:

a. Areas needed for ash dumps and other industrial refuse;

b. Areas of open-pit mines which have long since been exhausted and have not been adopted for further use;

c. Surface and top-soil land losses (floods or other causes);

d. The immediate vicinity of these lands.

In the case of mines the most important factors which have rendered the land unserviceable are the lands actually lost to mines and the areas used for dumping. In the case of open quarries, losses were suffered due to the need for dumping space and the unreclaimed or only insufficiently reclaimed grounds of exhausted quarries.

Losses of areas which have been taken up by dumps are the results of mining, metallurgic, and other industrial activity. This also explains the different petrographic composition of dumps. The composition of mining dumps is of wide variety. In hard-coal mining areas, dumps contain coal fragments and splint coal, other combustible coal-like materials, shale and slate, and various rocks. On the other hand, in brown-coal areas the dumps consist of sandy and clayey soil, rocks, and various mixtures of other mining refuse. The more sterile soil the dump contains, the more difficult is the reclamation and the more obvious is the need of bringing fertile top soil to these areas.

The most important tasks in the reclamation of mining and industrial areas are the following:

1. To turn the unsightly dumps into grounds which may be fittingly incorporated into the general picture of the area, which means that the height and size of the dump heaps must be levelled off to match the general appearance of the surrounding areas so that permanent trees and other vegetation may be planted.

2. To restore the areas previously used for dumping, the grounds of exhausted quarries, and other lost agricultural lands to normal social utilization, primarily agricultural or forest production.

3. By carrying out appropriate sanitation measures in the devastated areas and especially by replanting or reseeding these areas, to achieve a desirable improvement in the biological and, especially, hygienic function of the particular area. This is exceptionally important in industrial centers, because these changes will make the area attractive again for living. This is a factor which has a great influence on the stabilization of labor power.

At the present time, reclamation had not yet begun to catch up with the devastation. This is the result of very little concern in the past for reclamation, and this situation has had a rather adverse influence on the economic life of the territory, even in its biological function. It was not until recent years that increased attention has been devoted to reclamation.

In order that the reclamation work may be conducted on a planned basis, it is necessary, however, that some basic questions be taken care of. Along with the inclusion of reclamation plans in the project of mineral extraction, material and financial allocations for the reclamation works and their execution within the framework of the territorial plans are of special importance.

The newly-proposed delimitation of the land fund is one of the most important working stages. Land may be reclaimed for agricultural production (arable land, meadows, pastures, orchards), timber, and social use (parks, recreation areas, etc.). If possible, it is desirable that depleted and even desolated lands be returned to their original function. If this is not feasible, it is desirable to insure that lands be converted for the cultivation of such crops as would seem most suitable from the economic point of view (meadows, orchards, forests in place of arable land, etc.) or from the social point of view (parks, recreation areas, etc.).

The special nature of reclamation projects, the difficulty, complexity, and insufficient perfection of technological procedures, demand that this job be carried out by experts. This can be achieved if the reclamation work is concentrated in special reclamation centers the main task of which would be agricultural and forest-land reclamation.

These centers would also be in control of the lands which have so far been spared from depletion but which are marked for use in the near future for mining, construction, and other purposes. A proper and sound utilization of forests and agricultural lands in these areas is tremendously important.

Recultivation and, most of all, agricultural reclamation require a sufficient supply of good-quality soil, especially where biological or other fertilization is either altogether impossible or where its results are doubtful, as would be the case with stone dumps. Suggestions for the removal of the top layers of soil, its use, and selection of suitable places where it should be deposited are indispensable items in the reclamation proposals. Reclamation with the biological means is, however, the more suitable in every way and we use this method wherever possible.

Vegetable Production

In this part of the analysis and proposal, the appraisal and evaluation will deal especially with the extent of the areas sown, largely in relative figures and yields per hectare. In ascertaining the average yields, the average of a few years or even one year cannot be accepted as being satisfactory, since the yields may have frequently been strongly influenced by extraordinary growing conditions in individual areas.

The importance of establishing the structural composition of the plowland of each territory rests in the fact that this investigation may help uncover the inefficiency involved in failure to take proper advantage of the given natural and economic conditions and the reasons for the resulting disproportions in production. First of all it is necessary to focus attention on special crops (vegetables, fruit, grapes, hops, tobacco, and others) and forage crops on arable land.

In appraising vegetables the representation of main species of some special warm-climate varieties which are grown in the area are examined; further checked are the proportions of the vegetable-growing sectors, yields per hectare, and the total crop, and how well the needs of the population of the district and of the food industry are being met. Very important also is the question of the influence of the artificial irrigation of plants on increasing vegetable production. Examined is the production of green-house vegetables and the extent to which the needs of the local population are being met. Estimated further is the number of hothouses for the production of early-maturing vegetables and the possibilities of expanding the production of vegetables by utilizing the surplus heat of surrounding plants. Mentioned in the smaller prospective district plans are the areas of intensive vegetable

production and areas where the natural conditions are favorable for this method of cultivation. The indexes of vegetable production are also accompanied by a computation of the needed labor power, a calculation of the necessary fertilizers, and an estimate of the possibilities of using local sewage and refuse.

In reference to fruit, the number of trees grown per hectare of agricultural land should be estimated, as well as types and individual subtypes and varieties. Appraised is the total crop and the yields of fruit, the degree to which the needs of the population and industry are being covered, the influence of market orchards on the quantity of fruit purchased by the state. This category also includes fruit-tree nurseries. In districts where fruit growing occupies the primary position, the distribution of the market orchards or of the larger fruit-tree nurseries is indicated. In areas with a significant emission of fumes, ashes, smoke, gases, and exhalations from factories (chemical plants), e.g., the areas of Most and Sokolovo, the influence of these factors on the total crop is investigated and less susceptible varieties of fruit trees are selected (for example, the pear variety called "Kaporechki").

Other special crops, such as hops, grapes, tobacco, etc., are appraised only in districts where these crops are grown on a larger scale (the area of Most -- hops, Southern Moravia -- grapes, vegetables, tobacco). The appraisal is done in terms of current indexes: acreage, yields, crops, varieties, the manpower need, etc. Also appraised along with it is the state of necessary facilities and equipment, e.g., hops and tobacco driers, larger wine cellars, mechanized implements (hop-picking machines), etc.

Animal Production

Exceptional attention must be directed to animal production. It must, however, be dealt with in conjunction with vegetable production, at the same time considering other decisive territorial circumstances (areas close to cities). In analyzing animal production the following indexes must be taken into consideration:

a. the total number of head of cattle and the individual categories of farm animals per 100 hectares of agricultural land (in the case of poultry and hogs, arable land must also be included);

b. the proportionate number of cows in the herd and the proportion of sows out of the total number of hogs; the utility of farm animals, poultry, and water fowl, specifically as regards the following:

average yields of milk in liters per year, head, and day;
total number of eggs (per hen and year);

average weight increase of meat animals or meat poultry, mostly in grams per head and day;

the birth rate, the pure birth rate, the grading of individual types of farm animals;

the average yields of wool.

It is also necessary to examine widespread animal and poultry diseases such as brucellosis, tuberculosis, paralysis (especially in hogs), strongylosis in sheep, etc.

In certain areas attention is also paid to fish hatcheries, apiculture, silkworm breeding, gamekeeping, etc., as the local conditions of the territory may permit.

Background study material may be obtained from kraj and okres services of the State Statistical Office, the agricultural departments of the national committees, breeding stations, state fisheries, regional and okres apicultural and game-hunting societies, etc.

Very important is the appraisal of a well-balanced proportion between animal and vegetable production on the basis of prospective fodder calculation, the estimate of farm and synthetic fertilizers, and the calculation of bedding-straw needs. The profitableness of vegetable production and, therewith, of animal production depends to a great extent on the deposition of a sufficient quantity of animal and mineral fertilizers on the soil. The need for mineral fertilizers is reflected in the index showing the need of pure nutrients per hectare. In regard to animal fertilizers, attention should also be centered on secondary sources such as city refuse and waste, the humus fertilizers made of them, ashes, peat, etc.

Breakdown by Sectors

In the territorial breakdown by sectors, the organization of state farms, collective farms, and other production sectors are evaluated. The main task is to discover territorial disproportions between the location of individual production sectors and to create such a material foundation as would secure delimitation by sectors.

Agricultural Services

As regards agricultural services, the following are especially evaluated:

a. machinery and tractor stations, their territorial organization, investment and mechanical equipment, costs, etc.;

b. the location of state breeding stations and zoo-veterinary services;

c. agricultural schools of all types, their orientation and the number of students;

d. scientific and research institutes, their specialization, and the extent in which they contribute to the agricultural production of given areas in the form of their results;

e. the location of factories and the storage facilities of purchasing agencies with information on storing capacity and the quality of storage premises.

The above-mentioned services must be expediently adopted to the whole organization of agricultural production, they must be on a satisfactory level in the organizational respect, technically well equipped, and stand ready to commence their work. This is necessary because in a number of sectors of agricultural production success or failure depends precisely on good cooperation with these services.

Manpower

The question of manpower in agriculture is at the present time very serious and is expected to remain serious in the near future, too. Under manpower is understood that labor force which is permanently engaged in agriculture. For orientation purposes, however, the number of persons who are helping out in agricultural work are also included. Considered should be not only the total number of permanently-employed persons but also the number of hectares of agricultural land per worker, the age structure, and the number of workers broken down by sex. The age structure is very important, since the majority of workers permanently employed in agriculture are between 45 and 60 years old.

In the future computation of manpower the development of mechanization in planned and animal production, the gradual improvement of organizational measures and affiliated services, must not be forgotten, since all of the above items contribute to the reduction of manpower needs. On the other hand, intensification of agricultural production increases the demand for manpower.

Manpower needs are studied not only at the okres and kraj levels, but also at the level of villages, so as to make it possible to specify the areas insufficiently or only partially settled, etc. This also offers the possibility of enumerating in detail the areas which are in great need of manpower for agriculture or areas where a surplus of manpower may be expected in the future.

The Extent of Mechanical Equipment

Closely connected with the question of manpower is first of all the extent of mechanical equipment. When evaluating this question we should proceed from the analysis of natural conditions (mechanizational availability is cartographically recorded). This furnishes a certain guiding standard for the further evaluation of mechanized means. The basic material is obtained from all production sectors and state tractor stations; evaluated, as a rule, are the following:

a. the number of tractor units, the proportion between caterpillar and wheel tractors;

b. the number of heavy mechanized means, their implementation, and correct territorial location;

c. the inventory of special mechanized means;

d. the location of mechanized means.

The conclusions of the analysis must show which mechanized means must be supplemented, in what number, and where.

Raw-Material Resources

Agricultural production is an important raw-material foundation of the food industry. This concerns first of all sugar beets for sugar refineries; fruit and vegetables for the canning industry; furthermore, flax, potatoes, grapes, tobacco, milk, etc. The computation of the needs for and resources of the various raw materials will show us at the same time the proportion between agriculture and the food industry, and in the future will enable us to coordinate these two production sectors. In areas close to and around cities, a conflict often springs up between the production of raw materials for the food industry and the production of fresh agricultural products for the supply of the population.

The Supply of Fresh Agricultural Products

The population of large cities and industrial centers consumes a large quantity of agricultural products. The objective, then, is to supply these products not only in large quantities, but also in better quality. This concerns particularly products which may be damaged in long transportation, that is, products which spoil and rot easily. It is uneconomical to deliver from afar to the cities certain other products having a great content of water or those that may be grown close by. The task of agriculture in the areas close to large cities and industrial centers, to the extent suitable natural and economic conditions are present, is to

concentrate in the highest measure on products such as vegetables (especially hothouse vegetables and early vegetables), fruit (especially berries and strawberries), early potatoes, milk, eggs, and poultry, and to assure that the agricultural enterprises specialize in this production.

The supply of fresh agricultural products is the main task of the agricultural sector in the district plans of the areas closest to cities. The solution of agricultural problems in meeting the demand for good-quality and fresh agricultural products is, however, important in all the territorial plans which comprise territories with large cities.

Depreciation of Investments

Great emphasis must be placed on the appraisal of the effectiveness of proposed investments. It is necessary, therefore, to examine very carefully not only the cost of investments but also the suitability of their location and especially how they fit into the general future organizational patterns of the territory. So far these questions have received little attention, and this has often led to needless waste of investment means.

In order to be in a position to work out more exact proposals for investment projects, it is first of all necessary to evaluate the state of basic means of production, and to do so according to the general inventory of all production sectors, for the whole okres, and as dictated by the various categories of purposes (basic herd formations, transportation means, machinery, etc.) The same reason demands that the expenditures on agricultural investment projects be taken into account, usually in consideration of the expenditures since 1954, the year when the investment banks began to accumulate at least some of the information needed.

The Economic and Territorial Evaluation

The analysis of natural conditions, production, and the means of insuring it must be supplemented by an economic evaluation of the existing state of agricultural production as shown in the indexes of current and market agricultural production per hectare of agricultural land and per worker permanently employed in agriculture. The proposal is designed to provide economic justification of the suggested measures. The most important index is the value of gross and market agricultural production. The percentage of the growth of production in the perspective plan as compared with the current state, offers documentation in support of the suitability and correctness of the proposed measures. Besides the

justification of the correctness of the arrangement of agricultural production as a whole, it is also necessary to justify partial proposed measures, for example, the proposals for irrigation and drainage, the construction of humus plants, the use of fodder refuse, etc. Economic justification is also the main factor in deciding which alternative of the proposed measures can be considered as most suitable.

The final territorial evaluation must show, on the basis of a breakdown of the territory by agricultural production areas, how these areas cooperate with each other in agricultural production and also how they are doing in relation to other production and nonproduction sectors. The analytical part concludes with an evaluation of the problems of these territorial interrelationships and constitutes, in broad outlines, a proposal for solving it. The part of the evaluation which contains the proposal must in the final territorial appraisal give evidence that the proposed solution has the potential of producing the desired effect, namely, creating a qualitatively improved territorial arrangement.

The Principle of Comprehensiveness and the Result of Planning Agricultural Production in the Territorial Plans

In elaborating the territorial plans for the agricultural sector it is necessary to bear this principle constantly in mind, lest the submitted proposals lack realistic possibilities and not be fully implemented in practice.

Carefully appraised should be the importance of individual factors which either today or in the future may influence agricultural production, because if secondary factors gain in importance, they will fully or partly distort the final conclusions. The effects of individual measures may be judged separately. It is also necessary to review all retroactive effects of the proposed measures. This concerns not only the effect of nonagricultural factors on agriculture, but also the influence of various sectors of agricultural production. Otherwise it will be impossible to assure their final and over-all adjustment. For this reason the permanent cooperation of all sectors and the permanent scrutiny of individual proposals is necessary. Oversight or neglect, under- or overestimation of the principle of comprehensiveness, may result in a situation such as selecting unsuitable locations for building up large-scale hog-breeding or feeding facilities, planning the construction of large power plants in intensive agricultural areas, taking mostly relatively fertile land for construction purposes, making agricultural investments within the limits of future mining expansion, overrating some special factors of agricultural production, etc. Let us illustrate this by two examples:

In a certain intensive-agriculture area where a surplus of agricultural manpower is anticipated, the building of industrial plants is proposed to take care of this labor power. This industrial plant, however, has an adverse influence on agriculture (a marked decline of agricultural land, pollution of water and air, etc.). The demand for manpower to carry out the building plans of this plant is at the same time greater than the surplus of agricultural workers available, and this makes the workers commute to their place of work from further distances or else other agricultural workers are attracted by the job opportunities at the plant, which results in a diminished intensity of agricultural production. In the given example it would be more advantageous to intensify the agricultural production (greater need of labor power) and to build only a smaller food-industry plant which would use agricultural raw material.

Another example. Ostrava, one of our largest industrial cities, suffers from a great shortage of vegetables, especially hothouse vegetables. It would therefore be appropriate to have hothouses in the vicinity where the excess industrial heat may be utilized. The following facts are examined:

a. excess heat power has a low potential heating capacity and has so far not been technically and economically used for hothouses;

b. the vicinity of Ostrava has such a high degree of air pollution (especially in the southeastern part) that it would greatly handicap vegetable production by impeding the penetration of solar radiation;

c. there is insufficient consolidation of the socialist sector because the land is being held by many owners, which is the consequence of the Silesian building regulation;

d. the vicinity of Ostrava lies in the area of deteriorating soil conditions, and it is therefore not possible to insure these costly investments against the possibility of loss.

The evaluation of the importance of individual sectors, and thus also of the agricultural sectors and their place in the overall plan of development and organizational measures, is the task of the chief planner of the territorial plan. The integration depends partly on the personal views of the chief planner. The planner, however, should as a matter of principle not overlook the results of studies and materials concerning individual sectors. A great responsibility is borne by the men who are in charge of preparing agricultural reports as regards providing logical factual and intelligible argumentation, appraising particular factors, and pointing out the consequences which have had to be confronted, which are arising, or which are likely to come up. Then the chief planner

will have a clear idea of the importance of agricultural production in the territory in question and will have no problem assigning agriculture its proper place in the general plan.

Of positive value is the fact that in the territorial plans agricultural production is gaining in importance, and that the degree to which the importance of agricultural production is being asserted and accepted shows a general upward tendency. In the final elaboration of the chief planners the agricultural sector is legitimately occupying ever more the position which it rightfully possesses as one of the chief branches of the national economy.

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The Possibilities of Utilizing Agricultural Analysis in the Territorial Plans

A comprehensively prepared agricultural report can be used for both short- and long-term planning. The analytical parts of the report may not be used because they sum up all accessible material as of a certain date and evaluate it from the point of view of its complexity. They can, however, be incorporated in other eventual proposals or when changes are decided upon. It is obvious that proposals must be verified and adjusted as regards their practical application, as changes in the basic conditions will require this and unexpected developments must be taken into account. The parts of the territorial plans which deal with agriculture can, however, remain an orientation guide for further and more detailed study.

For the organs of the national committees at all levels the report is an effective aid in making direct decisions as to the expediency of a certain development, the orientation of agricultural production, the elimination of discovered disproportions in the territory, and judging the effectiveness of the allocation of agricultural investments.

Along with the organs of the national committees, other central agencies are being familiarized with previously unknown facts, since it is tremendously important that these agencies have comprehensive over-all knowledge of all components of the national economy. Without a thorough knowledge of the development of the territory, problems are often treated outside their context. This at times includes problems which in the course of further developments are dropped entirely.

This is seen most clearly in the example of the Most area, and generally in areas where rapid economic changes are expected to take place and where any ill conceived or poorly worked out agricultural investment could cause economic losses because of short-term usability. Another example is the construction of the Melnik electric power plant, which will practically eliminate the cultivation of some types of vegetables (cauliflower, lettuce, etc.). It is problematic whether or not it will be suitable to carry out along the Elbe River irrigation projects in full measure. This clearly proves that timely elaboration of territorial plans often entails new and yet unknown considerations, new and unknown even to the central agencies, which can have a broad economic effect. In the same way, for example, knowledge of the land fund decrease in the Ostrava area will influence the whole plan of amelioration and the over-all view on the orientation of agricultural production. The value of agricultural reports for every-day and future planning is evident also in the example of the district plan of the Zelivka River area, which clearly shows that agricultural construction in some areas must be eliminated, while on the other hand emphasizing the necessity of an immediate and speedy development of construction along the entire river bed.

Numerous examples could be quoted; the above-mentioned ones, however, undoubtedly suffice to prove that the reports are immediately useable by both the central agencies and the organs of the national committees, since most of the varied practical measures are often of great economic significance and scope and their usefulness may extend over many years. It is, however, necessary to realize that they must be continually supplemented and verified in order to be permanently useable.

Summary

Agricultural questions must be dealt with in all the territorial plans. The place of agriculture in the territorial plans, and especially in the district plans, depends, however, on the actual orientation of the plan, on the aim which it pursues in the given case. In some places agriculture occupies the primary place (the district plan of Southern Moravia); in other localities it stands among the main factors (the district plan of the South-Moravia lignite basin); and in yet other places it constitutes a supplementary link (the district plan of the Sokolovo-Cheb basin).

Examination of the analysis of agricultural problems, aims, content, and methods depends upon the character of the territorial plans. Agricultural questions receive different attention in the

mining areas, in the areas of hydroenergetic projects, areas close to and around large cities, in resort areas, and in intensive agricultural areas, and are also differently treated in the districts adjacent to the borders.

The latter part of the article describes the basic methodological procedure and the contents of the study. Agricultural questions are analyzed in three stages: analysis, draft proposal, and the final version of the proposal. The analytical part studies natural conditions, technical and economic questions of production, and conducts territorial and economic evaluation. The proposal consists roughly of the production proposal, methods of insuring its fulfillment (the main survey of land, labor power, and investments), and a territorial and economic evaluation of the proposal. Analyzed in detail are the contents of the examination of natural conditions, that is, the condition of the land, climate, water economy, and erosion; further, land resources, planned and animal production, distribution by sectors, agricultural services, labor power, mechanical equipment, raw-material resources, supplies of fresh agricultural produce, investments, economic and territorial evaluations.

The article deals with the principle of comprehensiveness and the results of planned agricultural production problems in the territorial plans. Without correlation not only within agricultural production but also between agricultural production and other production and nonproduction sectors, the solution of agricultural production issues in the territorial plans would be worthless. An important part is devoted to the question of graphic documentation.

The chapter on the possibilities of utilizing the agricultural parts of the territorial plans stresses the usefulness of the reports for central agencies, the national committees at all levels, and individual planning and production branches.

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SECURING MATERIAL SUPPLIES FOR COOPERATIVE AND ENTERPRISE HOUSING CONSTRUCTION

[Following is a translation of an article by Engineer Miloslav Kulich in Planove Hospodarstvi [Planned Economy] No. 2, February 1960, Prague, Pages 125-128.]

Solving the housing problem in a very short time, as we were enjoined to do by the XIth Congress of the Communist Party of Czechoslovakia, meant adopting certain measures, one of which is a new method of housing construction. Besides the forms of state housing construction that have so far been in general use, especially in 1960 and in the years of the Third Five-Year Plan, there will be a considerable number of housing units built in the form of cooperative and enterprise housing construction. The purpose of these new forms is to combine the interests of the residents with the requirements of the national economy in the solution of the housing problem.

It is in the interest of our society that cooperative and enterprise housing construction develope and help eliminate the housing shortage. Therefore measures must be taken to enable existing housing cooperatives and enterprises to build dwellings as soon as possible for their members or employees. Besides the measures effected in the field of financing, it was also necessary to remedy the method of organization whereby the material supplying of cooperative and enterprise construction will be regulated. This was essentially accomplished by the publication of the directives of the State Planning Commission "On the Method of Organizing the Material Supplying of Cooperative, Enterprise and Private Housing Construction for 1960."

Determination of the organizational principles was based upon the changed conditions under which the new form of housing construction is being effected. When in state housing construction material supplies of centrally distributed materials and products were assigned to supplying construction organizations through superior central organs, this procedure could not be adopted for supplying cooperative and enterprise dwelling construction. In state housing construction there is only the relationship between the supplying construction organization as the supplier of housing units "for the key" and the competent kraj national committee as the housing -- unit investor. From the point of view of the state plan, the total volume of housing construction is balanced with the volume of construction operations, which in housing construction

are carried out by the construction organizations of the various central organs. The material coverage of the volume of construction operations to be carried out in housing construction by the construction organizations is then determined for the competent central organs in relation to the over-all material supplies on the basis of the consumer indices.

In the case of cooperative and enterprise housing construction, the kraj national committee is an investor only in the broadest sense -- that is, as the bearer of the task of constructing the appropriate number of dwellings and as the organizer of this form of housing construction within the kraj. The various cooperatives and enterprises are the actual investors in this case. The ways in which cooperative or enterprise dwellings will be constructed can be various. Dwellings will be constructed a) entirely by supplying construction organizations, b) partly by supplying construction organizations and partly by self-help of the housing cooperative or enterprise members and c) exclusively by self-help of housing cooperative members or by the enterprises' own resources. Even though it can be objected that even in the case of cooperative and enterprise housing construction it is primarily a question of the construction of several-storey dwelling houses the construction technology of which calls for the use of much construction machinery and equipment as well as the cooperation of technicians and therefore the substantial cooperation of the supplying construction organizations, the fact remains that a certain measure of self-help is indispensable. This is particularly true because the extent of self-help operations directly depends on the amount of financial means that the future residents of the dwellings spend on covering construction outlays. The fact should also be considered that housing cooperatives can also be formed in connection with national committees, enterprises or individual agricultural cooperatives.

Therefore in cooperative and enterprise housing construction there are getting to be many more investors than before who, in view of the variety of changes in the proportions of supplying and self-help operations, will make it impossible to retain the method so far in effect of allocating material supplies for housing construction. In retaining the previous method of allocation the allotments would have to be assigned to the supplying construction organizations through superior central organs to cover supplying operations, and allotments would have to be assigned to the enterprises to cover operations that they are carrying on in construction with their own resources, and then allotments would be assigned to the kraj national committees to cover operations conducted by cooperative members in housing construction by self-help.

During the period of compilation of the state plan the proportions of supplying and self-help construction operations in housing construction cannot be known accurately enough to determine the allotments for the various organizations even on the basis of overall consumer indices. The volumes, expressed in values, of supplying and self-help operations would not then be adequate for correct determination of allotments of the various types of materials, and there would have to be a professional structure available of supplying and self-help operations according to the various organizational units to which the allotments would be assigned, since the various kinds of operations require various materials. But these data can not be available during the period of the establishment of the state plan because, among other things, the cooperatives will be formed throughout the entire year, and decisions will not be made on the proportions of supplying and self-help operations until after their formation.

In view of these facts, the previous method of allocating material supplies had to be changed. And so all allotments will be assigned to the place where the needed detailed knowledge is of how cooperative and enterprise housing construction shapes up, from the point of view of forms and time, and of what effect it has upon the organizational provisions for this construction. The kraj national committees are such a place.

The allotments of stockpiled materials and products will be determined according to published directives by the various kraj national committees; that is, for the whole range of cooperative and enterprise housing construction to be effected in the planned period in the kraj in accordance with the state plan. The allotments will be determined according to the consumer indices for the various types of dwelling houses agreed upon by the KNV [Krajske Narodni Vybory, "Kraj National Committees"] and the State Planning Committee. The KNV will proceed in assigning the overall allotments in such a way that they are assigned:

a) to the appropriate enterprises, in case of exclusive self-help on the part of the enterprises in enterprise housing construction,

b) to the appropriate housing cooperatives (or enterprises) in case of exclusive self-help on the part of housing cooperatives formed in enterprises,

c) to the appropriate supplying construction organization in case of a purely supplying method of cooperative and enterprise housing construction and accordingly also in case of a combined method whereby the supplying construction organization performs part of the work and part of the work is performed by the cooperative members or the enterprises by self-help,

d) to the supplying construction organization - that is, to the kraj association of enterprises in construction, in case of purely self-help construction of cooperatives formed in connection with national committees or JZD's. [Jednotna Zemedelska Druzstva, "Unified Agricultural Cooperatives"]

The object is to assign the allotment to the organization with the qualifications for ordering and procuring the allotted materials from the suppliers. It was based on the fact that it is convenient to assign the allotment directly to the enterprises and cooperatives formed in enterprises in instances in which construction is provided for with their own resources entirely. The production enterprises have a skilled supplying organization familiar with the problems of customer-supplier relationships that can be used along with transport means, warehouse space and so on to solve the housing problems of enterprise employees. On the other hand it would be incorrect to assign allotments directly to housing cooperatives that will be formed in connection with national committees or JZD's for work performed entirely or partially by self--help. It is not to be supposed that cooperative members would always succeed by themselves in settling problems connected with procurement of allotted material means, their transport, storage, etc. The allotments and the procurement of materials for self-help operations on the part of the cooperative members were therefore put under the kraj association of enterprises in construction -- that is, the supplying construction organization, which will in the great majority of cases carry out housing construction in the krajs. This measure will avoid splitting up the material supplies and, on the other hand, permit the concentration of materials to cover both supplying and self-help operations. It is also suitable because it is impossible to know the proportion of self-help operations as to volume and profession accurately in advance and it is also impossible always to assume that even a well known proportion of self-help operations will develop according to expectations. The supplying construction organization will thus assign materials to the cooperative members for self-help operations in harmony with the particular course of construction, while any discrepancy among the delivery cycles or in the consumption of materials can be resolved from their own supplies. But what still must be solved is the question of covering the outlays of the supplying organization for the material supplying of self-help operations.

The KNV is authorized to delegate the material-supplying function to the self-help of the cooperative members and to a construction organization other than the kraj association of enterprises in construction. In some krajs the use of okres construction

enterprises will be considered. The advantage is that the enterprises in this case are near the particular location of the housing construction, especially in the villages. But on the other hand the suitability of such a procedure must be considered, especially with an eye to the tasks of the okres construction enterprises in the maintenance of houses and construction of JZD service buildings.

The state plan will determine the allotments of the main construction materials, as cement, bricks, concrete and structural steels, lumber, etc. to the various KNV out of the stockpiled products. The same procedure will be adopted in the case of the chief centralized products distributed by the supplying ministries such as steel and wood, window frames, bath tubs, kitchen ranges, windows, doors, certain asphalts, novoplast flooring, parquet panels, plasters, plaster mixes, etc.

The enterprises, construction organizations and cooperatives are obligated to notify the KNV of the material means obtained for cooperative and enterprise housing construction from local resources. The KNV is then authorized to lower the allotments from the central supplies in accordance with the volume of the local resources. It has an interest because the means saved from the central supplies can be used elsewhere in cooperative and enterprise housing construction.

The necessary measures were also taken in the field of products planned by decentralization. Here it was a matter of providing supplying enterprises and organizations with information as to the overall requirements for the most important products of this group for cooperative and enterprise housing construction in the various krajs and to make it possible for the procurement of these products to be handled currently upon presentation of orders and to prevent duplication of arrangements for these products among the suppliers. The consumption indices were taken from the figures of certain kraj associations of enterprises in construction. Even though they can not achieve the accuracy to be had in compiling consumption indices for the various kinds of dwelling houses, they nevertheless orient production as to the extent of the demand for the various products for cooperative and enterprise housing construction. The KNV should correct these indices, for the types that will be built within the kraj, as far as possible for the suppliers. As a rule orders only without requirements for the whole year will be submitted for products planned by decentralization. The only exceptions are certain products of which there is a considerable shortage in the resources or of which there is need only in a few dwellings. These are: arches made of seamless pipes, welded wire meshes, forged and stamped flanges, wire-surfaced cast glass, cast glass without wire inset and built-in and attached furniture. In

the case of these products, the KNV must make the overall demand for all cooperative and enterprise housing construction in the kraj known to the suppliers by a requirement for the whole year. After arranging the allotment with the supplier the KNV will draw up the description for the enterprises, cooperatives and construction organizations in the same way as the description of the stockpiled products. Only the organizations that submit orders for stockpiled, centralized and listed decentralized products within the limits of the description submit and secure orders for decentralized products. They are accordingly the organizations to which allotments of centrally distributed products have been assigned.

The established method of distributing material supplies for cooperative and enterprise housing construction requires construction organizations engaged in housing construction to receive material supplies in two lines. The volume of work in state housing construction is covered for them by an allotment through the superior ministry, and the KNV assigns them allotments for the volume of work for cooperative and enterprise housing construction along with allotments to guarantee the appropriate self-help operations of the housing-cooperative members. With dogmatic application of generally valid principles in the planning and accounting of the material supplies, the construction organizations would have to receipt [evidovati] and in practice also order and store the various alloted supplies as well. But such a practice would not be feasible or practicable, would be ridiculous in certain cases and would not benefit housing construction. It is therefore suitable for the assigned allotments in the case of the construction organizations to be combined, of course with the understanding that a construction organization is responsible not only for the successful progress of state housing construction, but also for supplying operations for cooperative and enterprise housing construction and for material supplying of housing-cooperative members' self-help.

But it is apparent in every instance that the administration of material means is unclear. From the point of view of the supplying problems it would be suitable if the general (housing) construction enterprises were placed directly under the kraj national committees. At the moment, in the case of centrally planned products, the supplies for state housing construction and those for cooperative and enterprise housing construction could be combined in one supply assigned to the competent KNV in accordance with the planned number of housing units. Such a measure would also be important because the housing-construction investor, essentially the competent KNV, would also have the organization performing the housing construction under its direct jurisdiction.

The ideas developed in the course of cooperative and enterprise housing construction, especially in 1960, will be suitable to evaluate to form a reliable basis for further measures in the field of organization of material supplying of housing construction in the course of the Third Five-Year Plan.

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PROBLEMS OF PLANNING DECENTRALIZED INVESTMENT CONSTRUCTION

[Following is a translation of an article by Engineer Karol Ujhazy in Planove Hospodarstvi [Planned Economy] No. 2, February 1960, Prague, Pages 107-117.]

By now we have the first experience with the preparation of the plan for 1959 and 1960, and experience with the fulfillment of the plan in 1959. There is as yet no experience with the actual full effect of the new planning system, for this experience can be shown only for the two-year period 1959-60 and is not yet complete; but there are already certain elements here (as for example the description of normatives, the processing of the proposed plan in plants, enterprises and ministries) which should be used in the preparation of the actual proposed Third Five-Year Plan. In this article we shall present some experience of the Ministry of the Chemical Industry with directives for planning decentralized construction.

Experience with the Preparation and Description of the Plan for 1959-60

The basis for determining the requirements of decentralized construction was to be the objective criteria for establishing the requirements, as opposed to the nominal content (often only formally verified) in the old method. In view of the fact that these criteria could not be prepared in a short time for 1959 and 1960, the investment requirement was determined in such a way that for 1959 they counted on the means for completing constructions begun in 1958 (which amounted to almost 80% of the content of the plan besides general repairs, after deduction of the portion for machines not included in the budget). The remainder was distributed among the enterprises for very important constructions recently begun. The requirement for 1960 was determined according to the state of the basic funds and their consumption. It resulted partly from the fact that a considerable part of the limited means would have to be used to renovate the basic funds and partly from the fact that there was a single criterion for which there were already bases (from the results of the general inventories, in the planning of general repairs, etc.). The normatives for the requirements, so computed, of decentralized investments for 1959 were harmful to the

enterprises that had small construction beginnings from 1958 (for example n.p. [narodni podnik, "national enterprise'] Spolek, Usti nad Labem). Although there was less correction in the final determination of the normatives, it was already impossible to eliminate these errors entirely after withdrawing the reserves (2% according to the government resolution).

Determination of the means for constructions recently begun, as well as corrections among individual enterprises on the basis of certain preliminary nominal records of the content of the plan, was reminiscent of the practice of deciding on sub-limit construction in the old method of investment planning with all its advantages but also its disadvantages.

The great majority of the enterprises under the Ministry of the Chemical Industry did not then draw up normatives of enterprise interest from the level of the enterprises for the following reasons:

a) With inadequate investment means for decentralized construction, the enterprises could draw up only such normatives for plants as would guarantee low investment volumes. With low investment volumes, however, a normative will be less stimulating and remain almost without interest from the point of view of investment construction possibilities.

If for example a plant had an opportunity, in accordance with the established normative of enterprise interest, to invest Kcs 5,000,000 in the first year, Kcs 2,000,000 of which would be covered 40% by a dividend (the remainder from the amortizations), then in exceeding the plan of profit formation by 5% it would expand its resources for decentralized investment construction by Kcs 100,000. The effect of this increased volume as a stimulus is very limited from the investment-construction point of view. This also results from the specific relationship of profit to fixed capital in the chemical industry.

b) Concentration of investment means at the enterprise level will permit creation of the prerequisites for making greater investments and sometimes also for overall solution of the construction problem in certain selected plants, or concentration of construction in one plant alone. This prevents dispersion of investment means over a series of building areas, objectives and investment operations.

c) Decisions as to the permanent content of the decentralized investment-construction plan can be made with full responsibility on the enterprise level in accordance with detailed knowledge of the plants' requirements (according to plan [projektove] documentation, construction procedure, nominal machinery and equipment

requirements, etc.). The managements of the various plants will certainly also share in these decisions, as was the case in Spolana in Neratovice in drawing up the 1959 plan.

d) From a narrower view of investment construction, it would be more stimulating to identify the realization of certain investments (for example, social arrangements) in an auxiliary plant (from means concentrated in the enterprise or reserves when the enterprise has them) with the fulfillment of certain indices of the plant plan (for example, sales, operating costs, etc.). These questions have to do with a plant's jurisdiction and responsibility for production and sales. It is certainly correct when a plant gets the total volume of decentralized investments, in addition to a production task, that are needed to guarantee that production.

The savings made in the realization of planned decentralized constructions could also be left to the plant. The plant could use these savings to improve the plant's social, hygienic or cultural equipment. Decisions as to the use of means for GO [generalni opravy, "general repairs"] or reproduction investments [obnovovaci investice], which we can limit or restrict by sectors for certain types of production, can be left to the jurisdiction of the plant.

Evaluation of the Proposed Plan for 1959 and its Fulfillment

Last year we tried to evaluate the enterprises' investment plans for decentralized construction. We mainly compared how the plans differed from the prerequisites which we evolved at the Ministry in describing the normatives.

For example, a mere cursory analysis of the proposed organization plan of the MCHP [Ministerstvo Chemickeho Prumyslu, "Ministry of the Chemical Industry"] for 1959 showed that the extent of GO in it was in all 5% below the volume the Ministry judged. On the other hand, the proportion of reproduction investments in decentralized construction increased on the whole negligible and reached only 32.5% of the total decentralized construction without GO. In the 1959 plan this portion of the investments was reduced, which we designate in the old and new methods as so-called "machinery and equipment not included in the estimate of constructed objectives" (in favor of decentralized constructions). The total volume of this part of the decentralized-construction plan for 1959 is about 10% below the actual fact for last year and almost 40% below the same for 1957. For the present it is hard to judge whether this decline is correct or whether it is to the detriment of the main renovation of the machine park.

But the number of new constructions undertaken has substantially exceeded the prerequisites of the Ministry. Whereas the Ministry in describing the normatives last year posited that about

50 new constructions would be undertaken, there were actually 180 of them in the proposed plan (including constructions with credit financing). The average accounting cost of constructions begun is only Kcs 1,700,000 according to the plan, and the planned volume for 1959 averages Kcs 700,000. According to this, the average period of construction of one decentralized construction would be 2 1/2 years.

The analysis of the economic results that will be achieved upon realization of planned decentralized investment construction is for the time being incorrect.

In the transition to the new method it has not been entirely clear to us how far the analysis of the enterprises' proposed plan in regard to decentralized construction is to be carried so that we do not interfere with the jurisdiction of the enterprise managements, but on the other hand call attention to undesirable development in decentralized construction. This analysis can be deferred until the annual analyses of the enterprises, but this will be only a subsequent control. The plans for 1959 and chiefly the results of the fulfillment of the investment-construction plan in this year show that it is impossible to rely entirely upon the automatic effect of incentives and normatives in the sphere of decentralized construction.

The investment-construction plan gradually "developed" out of its original plan in the decentralized-construction field in the course of the year. As compared with the facts in 1959 the structure of the decentralized investment plan (without GO) in 1959 (according to the situation as of 1 September) is as follows:

	1958	1959
Total Decentralized Investments	100	100
Included Construction Work	32.4	39.5
Machinery and Assembly	67.6	60.5

The considerable increase in construction operations over last year shows that our investors did not confine themselves to mere replacement of the machine park with new machinery in 1959 but aimed more at reconstruction and construction of new objectives. This effort on the part of the investors is also evident from the abrupt increase in the number of decentralized constructions in 1959: 525 (not including n.p. Benzina and including PFP and constructions on credit) as compared with 342 constructions in 1958 and 455 in 1957. It still should be remarked, that the transfer of former constructions over the limit, which were decentralized under the new method, is insignificant in this figure (only 2%) and comprises only an incomplete 7% of the volume of the planned decentralized construction.

As regards the inclusion of decentralized constructions proper (that is, without GO and machinery not included in the account) in the basic directives, it amounted to only negligible changes in the development of the plan:

	1 Jan '59 plan	1 Sep '59 plan
Decentralized construction without GO and unincluded investments	100	100
Proportion of construction investment	59.5	58.7
Auxiliary investments	35.7	36.1
Including cultural, social hygienic and plant dining-hall investments	4.8	5.2

Over half of the decentralized constructions in the chemical industry are of a production character. Most of the auxiliary investments have to do with drain-water purification plants. The low proportion of cultural, social and hygienic equipment (5.2%) attests to the fact that the MCHP enterprises in limiting the extent of decentralized constructions give preference to production and auxiliary investments.

But the distinctions are very clear in the fulfillment of the decentralized-production plan as compared with the centralized-production plan. According to the analysis as of the end of September 1959 the centralized-investment plan was fulfilled only 62.9%, whereas the plan of decentralized construction without GO was fulfilled 78%. The comparison of the increase from the plan for the entire year broken down by months is indicative:

	I	II	III	IV	V	VI	VII	VIII	IX
Construction Centralized	4.8	5.6	7.6	6.7	7.3	8.1	7.0	7.3	8.5
Decentralized	6.5	7.3	10.1	8.4	9.9	10.3	8.8	9.4	9.5

Decentralized production has been successfully developed since the beginning of the year. Fulfillment of the decentralized-construction plan in toto will decrease the lower fulfillment of the GO plan.

Decentralized investments as of end of September	61.0%
Proportion of GO	46.0%
Decentralized investments without GO	70.8%
Proportion of uncovered investments	75.7%
Decentralized investments without GO on uncovered investments	68.4%

The fulfillment of decentralized constructions according to the main directions of their determination is relatively uniform.

Decentralized construction without GO and uncovered investments	68.4%
Proportion of construction investments	69.2%
auxiliary investments	68.4%
proportion of purification plants	76.4%
cultural, social, hygienic and catering investments	65.6%

The Ministry of the Chemical Industry, in the description of the plan for 1959-60, stipulated certain constructions as nominal tasks for the investors (established either as a condition for norms or exceptionally as constructions financed from centralized sources). The fulfillment of the plan of these constructions is on the whole on the same level as in the case of the other decentralized constructions:

In all	62.6%
Proportion of production items	60.9%
drain-water purification plants	76.4%

The nominal tasks in decentralized constructions of a production nature have been fulfilled 7.4% less than the average of decentralized construction for the whole Ministry. Fulfillment in the 14 decentralized constructions, which in previous years were above-limit constructions under the old method, lags by about the same percent. Of the total number of organizations under the MCHP in the enterprises that have centralized and decentralized construction, decentralized construction was fulfilled less than centralized in only a single enterprise. In all the others the relationship is the opposite. Fulfillment of the plan of decentralized investments, however, is very diverse, when we compare the various organizations under the MCHP. Thus, of the total number of organizations considered, which are planning decentralized construction, plan fulfillment in ten organizations as of the end of September is 10-23% lower than the average for the whole department, and in

seven other organizations (of which four are research institutions) the result of fulfillment is even more than 23% less than the MCHP average.

Analysis of decentralized-construction plan fulfillment up to the end of September of last year has also shown that a substantial part of the work and deliveries is secured in supplying, and that only about 20% of realized decentralized construction was effected with the MCHP enterprises' own resources.

The decentralized construction plan was successfully fulfilled in 1959 for the following reasons:

1. In 1959 the investors ordered more machinery and construction deliveries from the supplying enterprises than they had subsequently covered financially.

2. The investors take the initiative in securing decentralized constructions because, in a relatively short time, they acquire an increment of new capacities or improvement in production which shows up positively in the enterprises' economic results.

3. The plants' planning [projekcni means provide for the necessary planning documentation, and the plan [projektova] documentation does not delay construction.

4. In the case of constructions supplementary to the plan, it is entirely a question of small constructions that are more easily guaranteed and effected with the investor's own resources.

5. Almost 30% of the volume of decentralized construction consists of so-called machinery not included in the estimate of constructed objectives, which do not have long construction cycles and which the investors obtain relatively more easily from machine-construction enterprises during the current year.

6. In the 1959 plan the decentralized constructions are still projected that were processed [rozpracovany] from past years and for which supplier contracts were regularly concluded and were therefore materially covered.

Preparation of the Proposed Plan of the Third Five-Year Plan

The new planning method in the investment-construction sector can be fully employed in the five-year plans too - used, that is, to a greater extent for the field of decentralized construction as well. In November of last year the Party and government directives for the Third Five-Year Plan were drawn up. The working method in the decentralized-construction sector, or in establishing the decentralized-investment requirements as a basis for determining the long-term normatives of enterprise interest can therefore be summarized. This analysis can still contribute to the improvement of planning projects in the period of preparation of the actual

plans of the Third Five-Year Plan, and it can also provide information for the preparation of the long-term plan up to 1957 and the plan of the Fourth Five-Year Plan.

The work on establishing the decentralized investment requirements began in the MCHP in the middle of 1958. We can roughly divide the entire working method up to drawing up the directives into five steps:

1. The first step of the work in dividing up decentralized construction for the Third Five-Year Plan depended upon a very rough division of the total volume of investments into GO and investments -- 42.5 : 57.5.

The distribution was made in such a way that the volume of GO was determined by the amortization norms and the remainder was simply determined for the other decentralized investments. This procedure was to be sure very simple, but it did not guarantee actual satisfaction of the requirements, since it could be affected by faulty amortization norms. It should be pointed out that the amortizations in a single year (or in the course of five years) do not necessarily express the requirement of GO or reproduction investments correctly in just this year (or directly in these five years). This also applies to the fourth step in our operations.

2. Further distribution of decentralized construction (without GO) was based on certain materials and analyses the MCHP had at its disposal for the determination of decentralized investments. As distinguished from the preceding distribution, which went by the volume of investments determined by the SPK, this distribution determined the requirements without the restriction of the preliminary limit of the SPK.

The distribution, effected in absolute parts for the Third Five-Year Plan in general, was in the following proportions:

drain-water purification plants	7.72%
machine shops	4.48%
material stocks	3.02%
gasoline stocks	6.10%
special-purpose investments	3.85%
"C" machines	24.45%
research and accounting organizations	4.08%
other non-production investments	6.10%
expansion of unspecified production	40.20%

The relatively large proportion for so-called expansion of unspecified production was worked out in absolute volumes (allocated in the description to the various fields of chemical construction) in cooperation with the prospective plan department.

3. The third step in the work on distribution of decentralized investment means consisted in formulation of proposed requirements by the various departmental groups of the MCHP. The first proposals of the basic production tasks for the Third Five-Year Plan were the basis on which the various departments proceeded.

The decentralized-construction requirements, determined by this description, exceeded the SPK preliminary limit by roughly 20%. The total volume was distributed among the various departmental groups as follows:

inorganic chemistry	26.5%	rubber	7.0%
organic chemistry	8.1%	plastics	4.5%
artificial fibers	4.2%	fuels, technical gases	24.1%
		paper and cellulose	25.6%

At this step in the work the Ministry tried for the first time to determine the decentralized-investments requirement according to the individual years from 1961 to 1965. The basic deficiency of the requirements determined in this way was the fact that the trend of decentralized investments was downward:

	1961	1962	1963	1964	1965
without GO	100	96	81	66	52
including GO	100	100	93	87	81

The downward trend of the description of decentralized construction shows that the various departmental groups proceeded, to be sure, from the enterprises' main production tasks, but also that the development from 1961 to 1963 is the most important and that it is proposed to achieve this important development as early as possible. The urgency in the accelerated development of certain chemical products even in the first years of the Third Five-Year Plan also expressed this result to a considerable extent.

4. In the next step we tried to employ objective criteria in determining decentralized-construction requirements. Starting with the specific proportions of the chemical industry in the Third Five-Year Plan (when most production increment is assured by extensive centralized-investment construction), we classified the overall decentralized-construction requirements into three basic categories: a) decentralized construction to renew fixed capital (including GO); b) portion of decentralized investments determined for a purpose; c) investments to expand chemical production and to construct new capacities and the investments connected with them.

A) Calculation of the determination of the overall requirement for reproduction of fixed capital proceeded from the simple proposition that the volume of the amortizations expresses the correct degree of consumption of fixed capital and that it should therefore be equivalent to the volume of simple reproduction of fixed capital. In the latter we have included GO and reproduction investments from both centralized and decentralized construction. We also proceeded from the assumption that fixed capital acquired in the years of the Third Five-Year Plan themselves and in the last two years of the Second Five-Year Plan will not be reproduced. This time differential is of course less in the case of GO (when in the last years of the Third Five-Year Plan GO already also required fixed capital anyway that had been put into operation in the first years of the Five-Year Plan) but on the other hand the period would be longer in the case of the reproduction investments themselves. This consideration sould require more thorough processing and more calculation both from the past and from the determined period of the applicability of the fixed capital to the enterprises according to the various fields of chemical production. In view of these considerations we took as a basis the level of the descriptions as of the end of 1958. We then divided this entire volume of the fixed--capital reproduction requirement as follows:

--GO volume for the Third Five-Year Plan amounted to 59.5% of the overall descriptions;

-- we took particularly those constructions or their parts from centralized construction that have the character of simple reproduction of existing fixed capital. These investments amounted to 19.7% of the total volume of the fixed-capital reproduction requirements;

-- out of the total volume of reproduction-investment requirements including GO after deduction of GO and reproduction investments in centralized construction there was a remainder of 20.8%, which would therefore be secured from the decentralized investments as reproduction investments.

The description of reproduction - investment requirements determined in this way first of all for all branches of the chemical industry was then drawn up for the various national enterprises according to the proportions of the descriptions for GO (in the GO part) and according to the extent and nature of the consumption of fixed capital in the reproduction-investment part. The description, drawn up in this way, was then corrected in the case of those enterprises in which there is reproduction of fixed capital from centralized construction as well.

It should still be noted that the reproduction-investment requirement (without GO) could also be considered in the light of the volume of excluded fixed capital. But the level so far of exclusion of fixed capital is unsatisfactory and there are not yet enough bases for calculating exclusion in the years of the Third Five-Year Plan.

B) Investments for sales organizations, purification of drain water, budgeting organizations (VU [Vyzkumny Ustav, "Research Institute"]) and certain special investments were allocated [ucelove urceny]. In this category are decentralized-investment requirements established either for special studies previously planned (for example, drain-water purification plants), or appraisal (for example, budgeting organizations), or on other partial bases (for example, sales organizations).

C) The decentralized-investment requirement for the production increment was established by the prospective-plan section on the basis of the basic requirements for the development of capacities unsecured by centralized construction. The total volume established in this category was first divided into basic chemistry, processing chemistry and the paper and cellulose field, and it was then further divided into the various enterprises in which expansion of production was to be secured by decentralized construction. The total volume of decentralized construction (without GO) was distributed as follows: reproduction 33.5%, allocated investments 23.9%, and production expansion 42.6%.

Decentralized construction (without GO) was distributed as follows according to the various fields of chemical production:

chemical production proper	43.9%	fuels	9.8%
paper and cellulose	24.9%	rubber	9.3%
other - non-productive	12.1%		

But the decentralized-construction requirements established in this way exceeded the overall preliminary limit established by the SPK by 9.2%.

5. In the next step of the work on establishing the decentralized-construction requirements developmental studies were already available in which the decentralized-investment requirements were proposed by the producing economic units. In this stage of the work basic material was also already available on the preparation of the description for VHJ [Vyrobne Hospodarske Jednotky, "productive economic units"] as far as tasks in production and labor productivity are concerned. The requirements established in the preceding stage were then corrected in the light of these considerations. A very difficult feature of this stage of the work

was the necessity of reducing the overall decentralized-investment requirements almost 20% so as to maintain the preliminary limit agreed upon in the last phase of the negotiation with SPK and to use it as a basis for computing the normative established by the MCHP directives.

This difficult job had to be mastered by the workers who prepared the overall description of the directives for the productive economic units. The work on establishing the decentralized construction requirements was also made difficult in the final stage by the fact that during this period certain differences between the MCHP and SPK were finally resolved, as to whether certain constructions are to be centralized or decentralized. The volume of these budgetary constructions amounted to almost 10% of the total volume of decentralized construction including GO. The decentralized-investment construction requirements established in this way were then divided into the various categories in the fourth step: reproduction investments 30.6%, allocated 31.5% and production expansion 37.9%.

The total volume was then divided into productive economic units according to the basic production fields of the MCHP: chemical production proper 41.4%, fuels production 8.6%, rubber production, 5.5%, paper and cellulose production 25.9%, and other non-productive 18.6%.

The problem of establishing a preliminary limit of decentralized production or a separate normative of enterprise interest for all branches, in our case for the whole chemical industry, would require a separate analysis. But this goes beyond the limits of an article concerned more or less with the methods of description for subordinate organizations in a single branch.

Material Guarantee of Decentralized-Investment Construction

It is impossible to judge from the proposed plan for 1959 and 1960 as distinguished from the methods so far in use how decentralized investment construction is guaranteed materially. The suppliers, especially of machinery, agreed to fill the orders of the investing enterprises only for the time being, insofar as they did not refuse to accept them subject to cancellation in favor of centralized-construction tasks.

And so it seems that the stimuli in the new planning methods have not proved fully effective in the case of the suppliers, since it can not be supposed, short of exceptional cases, that the supplying enterprises would have filled their capacities with centralized construction, which amounts to only half the volume of industrial investment construction. But the fulfillment of the

decentralized-construction plan convinces us that the supplying enterprises' capacities are also adequate to far exceed the decentralized investment-construction plan.

It is difficult to conjecture what the situation will be in the preparation of the proposed Third Five-Year Plan. Long-term supplier relationships will be formed for decentralized investment construction only with great difficulty, and it appears that the investing enterprises in drawing up their proposed Five-Year Plans are in a position to achieve the best-concluded supplier relationships in the field of construction operations and deliveries from their own capacities and enterprise shops, and only to a quite insignificant extent in some deliveries from machine construction enterprises also.

In conclusion, we can sum up the experience of the Ministry of the Chemical Industry up to now in the field of decentralized-construction planning and of establishing their requirements as a basis for computing enterprise normatives as follows:

a) Attention should be called to the fact that no organ over the enterprises, or ministry, can determine the decentralized investment-construction requirement, even though it would be a case of objective criteria superior in themselves, insofar as it has no determined extent or nominal centralized investment-construction content.

We shall give an example of what extent it can have. According to the MCHP's proposal, eight decentralized constructions at a total estimated cost of Kcs 355,000,COO were to be realized in one enterprise in the Third Five-Year Plan, which amounts to over twice the amount of decentralized investment construction carried out in this enterprise, except for GO, in the Second Five-Year Plan. It is therefore evident that in general the normative for this enterprise would have been determined differently if the said constructions had been realized in centralized construction and not in decentralized construction. Such an investment volume will also affect the description within the framework of the Ministry. Of course if there are more such differences the decentralized construction requirement can not be worked out from the department [resort] for the various enterprises according to objective criteria. These differences between the department and SPK should always be eliminated as early as possible. This applies as well to differences between the department and the enterprises or the association and the enterprises.

b) The methods of decentralized-construction planning have to be carried out further on the ministry level.

The MCHP made an experimental analysis, for the proposed plan for 1959 and 1960, of the decentralized-investment construction of several national enterprises, comprising: average estimated cost of decentralized construction, average planned volume for construction for a year, average time of construction, proportion of construction operations, machinery and equipment, number of constructions begun, undeclared enterprise reserve -- the proportion belonging to the decentralized-construction volume; that is, both on the level of organs above the enterprises (associations) and in the Ministry.

The second part of the decentralized-construction analysis was to be some rough analysis of the effectiveness of planned investments with the indices: production value, total operating outlays, including amortizations, profit, profitability, number of workers (including laborers), labor productivity, increment of fixed capital (including value of plans), and fixed-capital requirement per Kcs 1 of production value. The indices were to be computed in their final (planned) value; i.e., as they will appear in the average of the year in which they will be placed in trial and permanent operation (for example, 1959 and 1960). These indices are to permit collation of the investment construction plan with the other parts of the plan and also provide bases for analysis made more broadly and from other points of view. Whereas the first part was drawn up for simplicity and relatively well in view of the transition to the new methods, there was obscurity and conflicting interpretations about the enterprises in the second Part (economic results). Therefore these indices can not be processed for the Ministry until they are checked and corrected.

c) The decentralized-construction planning methods should be carried out in the Five-Year Plans in the same way as in the annual plans.

In addition to "The investment volume and structure and activation of fixed capital for decentralized investment construction," the enterprises must plan "The main fields of the investments" and "Activation of capacities" (productive and non-productive) for decentralized construction as well. The second part of the decentralized-construction plan should again be some analysis of the economic results to be achieved by planned decentralized construction; see b) above. This part is to be of much greater importance in the Five-Year Plan than in the annual one.

d) In the same way, the investigation of some of these indices should be included in the accounts, statistics and reporting.

The present statistics are so simplified that they offer almost no bases for more penetrating analyses in this direction in the enterprise organs. The MCHP therefore conducted a one-shot analysis in the form of a quite simple tabular commentary on plan fulfillment in the month of September. In this analysis we took up plan changes from the beginning of the year, basic directions of decentralized construction and plan fulfillment especially according to the various decentralized constructions. We want to make such an analysis throughout at the end of the first half and then as part of the annual analysis.

e) The annual analysis of enterprise activity should also include analysis of these indices. Besides analysis of investment-plan fulfillment and fulfillment of the plan of introduction into fixed capital and incipient-construction analysis (including un-assembled machinery, chiefly imported), it should also include analysis of the economic results already achieved by decentralized construction in the preceding year.

The objectives we have been carrying out so far in the Ministry of the Chemical Industry (expansion of annual-plan methods, analysis in September of the past year) were correctly understood by the investors. We are trying to make the analyses, with which we supplement the decentralized-construction planning methods and control of their fulfillment, primarily serve the administration of the enterprises, chiefly of the larger enterprises with several plants, and then to make possible an adequate review on the level above the enterprises too. For us it has essentially been a question so far and will also be a question in the future of what the government expressed in its Resolution of 14 October last year: "to see that the subordinate elements in decentralized construction are assured the greatest economy and efficiency; to control the decisions of the subordinate elements in questions of decentralized construction and evaluate the results achieved."

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THE WAGE REFORM -- THE BASIS OF A SOUND WAGE POLICY

[Following is a translation of an unsigned article in Planovane Hospodarstvi [Planned Economy], No. 2, February 1960, Prague, Pages 81-87.]

More than a year has passed since the reform of the industrial workers' wage system was announced in a letter of the UV [Ustredny Vybor, "Central Committee"] of the KSC [Komunisticka Strana Ceskoslovenska, "Communist Party of Czechoslovakia"]. In 1959 the principles of the reform of workers' wages came up for extensive discussion among our workers and became the concern of Party and union activists; the reform was also discussed in detail and with specific examples in the daily and trade journals. But the main thing is that reform of the workers' wage system was tried out last year in many plants in all branches of industry.

This great year-long trial fully confirmed the correctness of all the basic principles of the reform, and so by this time we are already implementing it extensively. By 1 January 1960 over 900,000 workers were being paid by the new system. Some branches, like the food, chemical and fuel industries, had already introduced the new system in the routine of all plants by the beginning of 1960. It is to be fully expected that the new wage system will have been introduced in all industries before the end of the first half of this year.

Experience so far with the new wage system has confirmed the fact that this measure can not be understood apart from other questions of current economic policy and that no self-serving change of wage scales or reclassification or the like is to be found in the reform. But it does show that it is a basic measure of profound economic significance closely bound up with the KSC's entire economic policy at the present stage of socialist construction.

An important part of the struggle to increase the effectiveness of our national economy is in its management. Therefore basic measures have recently been taken to improve management, planning and financing, based upon the standards of the enterprises and of self-interest. This is certainly not fortuitous. Even though we often already try to envisage a communist society in all our thinking we must not forget that we are living in socialism, in which every one's self-interest is an important incentive for our labor. From this point of view we are certainly right, therefore, in granting

means to the enterprises according to their merits. And finally, we determine the wage funds for the enterprises on the basis of their efforts to raise labor productivity.

On the other hand, the disorder up to now in salaries and our obsolete wage system have made it possible to do away with the principle of material self-interest. And so we must regard the reform of the wage system as a logical continuation of Party and government planning and financing measures, as a measure that logically complements the system of material self-interest.

Improvement of the wage system has now become an indispensable requirement of our every-day effort to improve industrial management and planning. From this point of view three basic principles of the implementation of the reform are of cardinal importance: general raising of wage scales, regularization of standards and solution of the problem of forms of wages.

The low wage scale in effect so far, which has advanced by only about 50% of the average wage earned in many branches of industry, has interfered with the effect of the wage system upon management and interest in qualification and as a result has made it practically impossible to carry out the socialist principle of reward according to the quality, quantity and social importance of the work performed. Then the level of the standards was adjusted in practice to these low wage rates, a level which in most branches of industry was exceeded by an average of about 180%. And this situation made possible not only great differences in the stability of the norms and thereby also important differences in ability to exceed norms, but also technical standardization of performance norms lost its active role in direct production management in the workshops and did not affect the growth of technology or the progress of production technology. The wage reform depends upon the regularization of the technical standardization of norms and requires an increase in the wage-scale level of 75-90% of the overall average wage. We must therefore see in the new wage system the basis of a thorough intensification of direct management in the workshops and the basis for rapid introduction of new techniques and technology into production.

The wage system so far in effect has also become obsolete from the point of view of the forms of remuneration in use. The theoretically correct principle of preferment of piece payment has resulted in the considerable expansion of standardization of work into fields where conditions were not right for it. Bonuses have been insufficiently used with piece payment in the wage system so far and have often even been merely a formal part of hourly wages. Regularization of the forms of remuneration in use is accordingly an important part of the reform, and their correct use may become a substantial help in improving management on the basis of the workers' material self-interest.

The gradual adaptation of the salary system to the specific conditions of the various industrial branches brought about in the past unwarranted distinctions in the judgment of certain questions, such as remuneration for the regular professions, for work under difficult conditions, etc., alongside definitely positive results. These unwarranted distinctions practically destroyed the socialist principle of remuneration, and so the resolution of these questions in the new wage system expressly intensifies the application of socialist principles of remuneration in our payment of wages.

The raw-materials and heavy-industry branches have an ever more important function in our socialist structure. And so differentiation of wages by branches according to the social importance of the various branches is an important principle of our wage policy that has been gradually applied since 1951. It came about as a gradual differentiation of an originally uniform wage scale, as for example in the coal, industry, the metallurgical and ore industries, and in chemistry and power. But despite the adoption of these partial measures, which played an important part in the development of our wage system, our wage-scale system as a whole is quite obsolete, and with its low average level in relation to average wages earned it has made it possible in practice to considerably nullify wage differentiation among the branches of industry. The introduction of the new wage system must accordingly be understood as a reinforcement of differentiation among the branches and wage preferment of key branches in harmony with the tasks of the Third Five-Year Plan and our long-term development.

Technological development is of primary importance in our further development, but this does not mean just perfected machinery. The men who will produce and operate this perfected machinery are most important here. Even if we hold the qualifications of our workers in high esteem we must direct all efforts toward their further intensive growth from the point of view of our prospective tasks. One of the chief measures to improve qualifications must then be wages. Our former wage system has inadequately performed this function. There are many instances where highly skilled workers have made less than those with average qualifications. We expect the new system to provide us with a more correct evaluation of skilled labor and thereby create an important condition for the steady growth of our workers' qualifications. The wage-scale qualification catalogues are becoming an effective instrument of this principle.

An important part in interesting our workers in constantly improving their qualifications is certainly also played by the establishment of a new wage system to remunerate workers in proportion to their qualifications in cases where a plant can not guarantee them work in their fields for a temporary period.

The connection of wage reform with the rise of the working class living standard can not be overlooked in reforming wages in connection with other measures. The workers' living standard is primarily determined by the nominal wage increase under conditions of stable and gradually decreasing prices. Regularization of remuneration with normal increase in average wages would mean higher wages for part of the workers but would inevitably result in lower wages for some. In view of the economic progress we have made particularly in the last few years in raising labor productivity and the favorable development of wages, we can effect a reform of the wage system with a generally more rapid increase of nominal wages. This makes it possible to cut down considerably on the number of cases where wages have to be lowered and accordingly to conduct the reform as an improvement in the workers' living standard. We are thus carrying out one of our Party's basic ideas, already formulated by Comrade A. Zapotocky, that in accordance with the development of our national economy, we shall struggle against leveling and support socialist differentiation of wages in harmony with socialist principles of remuneration.

Results so far in the plants where the new wage system has been introduced show that the aims of the wage reform can be accomplished. The proportion of the wage scale in average earnings per hour varies in the various branches from 73 to 83% in the case of piece wages (averaging 79%), 72 to 86% (averaging 83%) in the case of hourly wages with bonuses and 81 to 94% (averaging 86%) in the case of simple hourly wages.

Technical standardization has improved considerably in the course of carrying out the reform. In particular, the proportion of technically substantiated norms has gone up considerably in all branches, amounting to about 75 to 80% of all norms. The improvement in performance norms is apparent from the fact that their high over-fulfillment has dropped and their average fulfillment by individual branches has leveled off. The following comparison affords the best idea of the current situation:

Plants of the Ministry of:	Average Fulfillment of Performance Norms		Proportion of Technically Substantiated Norms
	Before Reform	After Reform	
Fuels	119	108	80-90
Foundries and Ore Mines	130	109	70-80
Chemical Industry	185	116	80-90
Heavy-Machine Construction	237	122	50-60
General-Machine Construction	215	116	55-65
Consumer-Goods Industry	154	105	80-90
Food Industry	168	109	85-95
Total	173	111	75-80

The new wage system has made itself particularly evident in the change in the forms of wages in use. It should be noted in particular that the new system results in the elimination of the fictitious piece wage and manifests itself in a definite decline in the proportion of workers paid according to the piece wage. Whereas about 70 to 72% of the workers worked for piece wages before the reform, this proportion went down to 54% in plants where the reform had been instituted. On the other hand the proportion of workers working for hourly pay with bonuses showed a substantial increase to about 37%. The extent of the use of the various forms of wages is to be seen from the following table:

Ministry	Proportion of Workers (%) Compensated by:		
	Piece Wage	Hourly Wage Bonus	Simple Hourly Wage
Fuels	49	36	15
Foundries and Ore Mines	44	38	18
Power and Water Economy	1	97	2
Chemical Industry	24	56	20
Heavy-Machine Construction	49	43	8
Precision-Machine Construction	63	26	11
Consumer-Goods Industry	62	30	8
Food Industry	64	31	5
Total	54	37	9

The proportion of bonuses in wages in plants where the new system has been introduced varies from 8 to 18%.

The importance of bonuses has increased in view of the substantial increase in the proportion of compensation by hourly wages with bonuses, and the fact that bonuses are given for piece work. Collective bonuses have been used more widely in plants with the new wage system for fulfillment of the plan for workshops, centers, laboratories or shops, as well as bonuses for quality especially in plants of the power, consumer-goods and food industries.

The principle of evaluation of workers' qualifications, which has found expression in the introduction of wage-scale qualification catalogues, has had a great response in the wage reform. The overrating of the qualification items was intended to support the development and introduction of new techniques and technology. New trades were entered in the catalogues based on the latest techniques and technology and requirements based on the

new techniques and most progressive working methods were also featured in the qualification characteristics. The introduction of wage-scale qualification catalogues in a large number of plants has helped improve the distribution of manpower and aroused really keen interest in the acquirement of qualifications and their systematic improvement.

The economic results of enterprises preparing for the introduction of the new wage system and of those already introducing it show that the complexity of this measure has been correctly understood in most plants. It has been apparent in the accelerated growth of production and labor productivity. The latter was nearly 1% higher in these plants than in the others and the plan was overfulfilled by 2.7%.

Despite the faster wage rise that also took place in these plants, wage outlays per Kcs 1 of goods produced did not go up in any of them, whereas they went down below the plan in many (about 35%).

The thorough check on the production technology used in plants introducing the new wage system and the achievement of a whole series of technical and organizational measures and improvements are largely responsible for this favorable result. According to incomplete data the technical and organizational measures adopted in the plants during the first half of last year resulted in a saving of over Kcs 180,000,000 and improvements worth over Kcs 60,000,000.

Experience so far fully guarantees that the new wage system will be introduced successfully throughout our entire industry during the first half of next year and that the established goals in the wages field will be achieved, as well as better economic results than originally expected.

Although favorable results have so far been achieved in the introduction of the new wage system, certain difficulties can not be overlooked which the introduction of the new wage system will still encounter in the future in enterprises and plants where wage irregularities are greatest. Every effort must now be made toward responsible preparation in these plants, especially in the field of technical standardization.

And so it should likewise be realized that the introduction of the new wage system does not complete the improvement of our wage system, the reform of which can not be regarded as a one-shot operation, but as a permanent process involving systematic and regular attention to wage questions. It would be a very serious error if the attention now being devoted to wage questions by Party and union organs, plant administrations and the workers themselves were to be relaxed after the introduction of the wage

system. This regular and systematic attention is indispensable because a number of the principles of the new wage system will become effective later on. It is also indispensable because all problems have not nor could be solved upon its introduction.

Attention will also have to be given from these points of view to the basis of the new system, the technical standardization of labor. As has been mentioned above, the course of the introduction of the new wage system so far in this sector can be regarded as a great improvement. But it must nevertheless be realized that we have not as yet succeeded in solving certain problems, as for example standardization in piece-work production, coordination of norms, etc. Also the proportion of technically substantiated performance norms in the various branches is still unsatisfactory. More detailed evaluation of the quality of performance norms according to the extent of their fulfillment shows that we can not be fully satisfied with the new norms. Considerable differences among individual plants, main and auxiliary shops and the various professions are to be seen in the average figures on fulfillment of norms, and fulfillment of norms in the various classes. It will therefore be necessary to strive for a mutual "balancing" of norms. The following figures also show the importance of this work:

Ministry	% of Workers Fulfilling Performance Norms		
	to 100%	100-120%	over 120%
Fuels	9	75	16
Foundries and Ore Mines	11	69	18
Chemical Industry	6	63	31
Heavy-Machine Construction	15	33	52
General-Machine Construction	17	42	41
Consumer-Goods Industry	32	54	14
Foods Industry	5	86	9
Total	12	66	22

Technical standardization of labor will also require special attention, since only now has one of the major principles of the new wage system been checked in practice, that of the variation of norms with the adoption of technical and organizational measures and with technological changes.

Technical standardization of performance in the future must not merely passively reflect production organization and the technology in use but must actively influence it. And so technical standardization must become an integral part of every-day management of workshops, plants and enterprises.

The new wage system has brought out the questions of specific organization of wages and of the use of wage forms in sharp relief, so that we can not stop at a one-shot adaptation of wage organization to present production relationships or one-shot revision of the wage forms now in use. Wage organization is an important feature of every-day production management, and therefore these questions will also require systematic, regular attention. The wage forms will also have to be adapted to the tasks facing the individual sectors, and they will have to be adapted more boldly to changes in technology and production organization.

Bonuses are an effective means of stimulating the material interest of collectives and individual workers in the solution of economic problems. But they can perform this function only if they are properly applied, if they are understood in principle by the workers, and if their amount is sufficiently flexible. They must therefore become an active instrument of enterprise management. The present bonus situation is far from satisfactory, so that this question must be regularly studied and worked upon.

The preparation and introduction of the new wage system in our plants has attracted our workers' attention to wage policy, an important element of management. Our workers have convincingly demonstrated their keen interest in the elimination of wage irregularities, the improvement of management through a wage policy and the improvement of the economic results of their plants. It is now a matter of supporting the economic leaders as well as this keen interest of the workers in the field of wage policy, which will guarantee the elimination of wage abuses and wage leveling through the reform, and consequently the creation of conditions in this sector as well as for the further successful development of our national economy.

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QUESTIONS OF THE DEVELOPMENT OF THE COAL INDUSTRY IN THE THIRD FIVE-YEAR PLAN

[Following is a translation of an article by Engineer V. Rain and Engineer M. Seliga in Planove Hospodarstvi [Planned Economy], No. 2, February 1960, Prague, Pages 99-106.]

Solid fuels occupy a decisive place in our country's power balance in regard to our natural resources. In 1950 the proportion of coal in our total primary sources amounted to 97.6%, in 1955, 97.1%, and in 1960 it will be about 90%. The proportion of other primary power sources in the power balance, including liquid fuels, water power and natural gas, is very small in the Second Five-Year Plan.

Important progress will be made in the Third Five-Year Plan in the structure of our primary power sources. Large deliveries of crude oil from the Soviet Union will substantially increase its proportion in our power sources. But notwithstanding this, coal is still an important and decisive power source. Therefore the directives of the Third Five-Year Plan call for further substantial development of the extraction of fuels, emphasis upon rational use of fuels and reduction of specific consumption of other kinds of power. Special attention will also be given to the use of cheaper fuels, particularly through the construction of large stations [spotrebice] in the coal areas, as it would be uneconomical to transport cheap fuels to distant stations.

Before discussing certain tasks in the fuels branch in the Third Five-Year Plan, we must mention, at least briefly, the development of the coal industry from 1956 to 1960.

We made further important progress in coal extraction in the Second Five-Year Plan. 26,400,000 tons of coal will be extracted for the market in 1960, or an increase of 26.4% over 1955. Coal extraction in the Second Five-Year Plan fully secured the planned development of our national economy, it is true, but on the other hand it could not quite satisfy the demands of foreign trade.

What were the deficiencies in this branch? The chief difficulties lay in inadequate extraction capacities, which is also why coal extraction up to 1956 was increased only by opening up internal reserves, since earlier inadequate geologic prospecting did not permit construction of new mines. The great importance of our coal industry is due to the fact that high-quality coke coal is mined in the Ostrava-Karvinna Region and there is a shortage of it in most of the people's democratic countries.

The steady growth of extraction in past years has required the introduction of new mining machinery, particularly Soviet combines (Donbass and Gornak types). The Ostrava miners have made great progress because of these machines. But the difficulty is that the excellent results of the work of some collectives have not been sufficiently publicized and similar methods are not used in other plants. That is also why total extraction with combines and plows in the OKR [Ostravsko-karvinsky Revir, "Ostrava-Karvinna Region"] amounted to 15.7% of the overall extraction in 1958. But in mechanical mining must also be included mining with channeling machines, explosives, etc. Despite this mechanization a good deal of coal is still mined by hand.

The greatest progress has been made with extraction of brown coal. Coal for the market will be 39.3% over the 1955 figure in 1960 and will reach 53,400,000 tons. Up to 1958, although there was a substantial annual increase in brown-coal extraction, the requirements of the national economy were met only with considerable difficulty and in many instances by extraordinary measures and without the needed reserve extraction capacities. In 1958 the results of the efforts of the Party and government on behalf of our coal industry became apparent here. During the first three years of the Second Five-Year Plan 6,800,000 tons of new extraction capacities were put into operation. In the Sokolov region, a grading installation was put into operation in Tisova with a capacity of 5,000,000 tons a year. To secure extraction, our machine-construction industry delivered 32 heavy machines to the miners before 1959, including 22 rotary excavators and nine heavy machines for depositing overburden. Thanks to mechanization and the elimination of deficiencies in railroad transport there was complete success in meeting the brown-coal requirements of the national economy and forming reserves in extraction capacities.

On the basis of the results obtained in the Second Five-Year Plan, further rapid development of the fuels branches was possible. The directives of the Central Committee of the KSC [Komunisticka Strana Ceskoslovenska, "Communist Party of Czechoslovakia"] and the government for drawing up the Third Five-Year Plan require the following tasks of the coal industry:

Extraction of coal in 1965 will amount to 35,500,000 tons or 20% more than in 1960. The increase in brown coal will be about 5,900,000 tons and will be practically secured in the OKR, where extraction in the Third Five-Year Plan will increase by 22.5%. In the other coal regions extraction will practically cease in view of the coal supplies at the 1960 level.

Our planned coal extraction is secured by the construction of new capacities and extended mechanization. But the chief prerequisite is the prompt construction of new and reconstructed mines. During the Third Five-Year Plan extensive investments will be made in 23 mines. Ten new mines will go into construction and 13 will be gradually reconstructed. The average progress in the working front [fronta] will go up to 1.57 m per day, and what with prolongation of the average length of the working faces [steny] the extraction of one mining operation will reach a capacity of 320 tons per day as compared with 230 tons in 1960.

Combine extraction in the OKR will reach about 41% of overall extraction, and in the other coal areas about 13%. Through the introduction of effective machinery, the proportion of hand-mined coal per mining operation will drop from 29% in 1960 to 19.5% in 1965 in the OKR.

The OKR workers must also consider the extraction of coke coal, of which they have a quota of 18,500,000 tons in 1965. Through this production we are securing the development of our own metallurgy and at the same time we are also helping some of the people's democratic countries. Fulfillment of this task requires construction of new dressing plants with a capacity of 8,700,000 tons. Coal will be processed selectively in new washing plants. This will make it possible for coking plants to effect consistent homogenization of the charge by means of coal shifts and thus secure quality production of metallurgical coke.

Brown-coal extraction is to reach 73,000,000 tons in 1965. The extraction increase will come primarily from the pits of the Chomutov-Slatenice coalfield. We shall achieve increased extraction by further expansion of pit extraction, expansion of the heavy-machine principle, electrification of transport and gradual introduction of conveyor-belt transport, which will result in increased use of basic capacities and further increase in labor productivity. New mines will be opened up only as construction of new power capacities proceeds.

In the future we shall be concerned not only with the extraction of brown coal, but also with its quality. Because the proportion of coal with a high waste content will be increased in the Third Five-Year Plan, the Hercules and Ledvice washing plants will be put into operation besides the appropriate graders and crushers. In the Sokolov region the Vresova combine, with a large grader, will go into operation. Distribution of brown coal will not increase, since construction of important stations will go on directly in the northern Czech regions.

Extraction of lignite will reach about 4,200,000 tons in 1965 and will secure consumption chiefly in the local stations.

Gas distribution is to have an important part in the Third Five-Year Plan. Production of illuminating gas will reach 2 mld m^3 in 1965 and will be 165% above the 1960 figure. Production of coke-oven gas will reach 5.2 mld m^3 in 1965 and will be about 50% above the 1960 figure. Production of illuminating gas will be secured by construction of new pressure gas works and coking plants. The Uzin and Vresova gas works are expected to go into operation along with the expansion of the gas works in the Stalin plants. Cracking stations for gasoline and possibly also crude oil will be further sources of illuminating gas.

The considerable development of gas distribution will enable us to supply about 1,000,000 households with long-distance gas delivery up to 1965. The construction of about 1,870 km of long-distance gas lines will permit satisfactory gas supplying in the various areas. The directives provide that during the Third Five-Year Plan we should construct and connect a subterranean gas reservoir to an overall distribution system to secure better use of pressure gas works and to make use of annual increments of coke-oven gas.

The OKR will also be of primary importance from now on for common coal, extraction of which will reach 85% of overall extraction of common coal and 100% of the extraction of coke coal in 1965. That is also why the Party and government directives for the implementation of the Third Five-Year Plan are mainly directed toward this region. Among the most important tasks of this region are: prolongation of the average length of the working wall to at least 130 m in 1965, or 27.4% over the 1958 figure. The planned average length for 1960 amounts to 107 m. In opening up the mining fields for this length 34,726 m of crosscuts and 343,420 m of galleries and shafts were cleared in rock in 1958. While 21,800,000 tons of coal were extracted in 1958, the extraction of rock out of the total extraction of coal and rock amounted to 21% in all, and this proportion amounts to 26.6% compared with the coal alone. The production capacity of the extraction equipment was used to the extent of about 93% and was thus unnecessarily overloaded by extraction of rock. Complete elimination of rock extraction is almost impossible in some plants. But if it could be reduced by only 10%, it would be a great advance in extraction operations. Therefore short working walls require many mine galleries, a considerable rock extraction and of course many shifts for transport and maintenance. For example, in 1958 out of the total number of shifts worked in a mine, 39.2% were in cutting, 17.2% in preparation, 24.1% in transport, and 19.5% in maintenance.

The large number of shifts in non-productive sectors, particularly in transport and maintenance, is chiefly responsible for the fact that the mine and overall efficiency did not rise in accordance with efficiency at the pillar. Overall efficiency will be improved by decreasing the shifts in maintenance and transport, without resorting to any changes in the work at the pillar. We think the attention of the plant administration should be given to this.

The above-mentioned facts of course affect the development of production outlays. Wages are the chief component of production outlays, being about 60%, and materials, power, amortization et al. being about 40%. With the present average length of working faces, reduction of outlays is quite limited, and it is a question of savings in materials only. By increasing the average length of the working face, the length of the galleries will be decreased and thus their construction materials and shifts and resulting wages, which would be needed for clearing galleries, will be saved.

Another important advantage to increasing the average length of the working face is the greater use of mining machinery. At present-day operating speeds channeling machines can throw up double lengths of existing working faces.

Besides the above-mentioned advantage, increasing the average length of working face also affects the simplification of the air passages, reduction of the consumption of explosives, increase of working capacity, concentration of extraction, etc. This means then that the greatest possibilities for reducing production outlays lie in increasing the average length of the working faces.

What conclusions have led to the choice of such short working faces today? Have they any advantages? They result from the situation in our mines today and the present organization of the labor.

It is not hard to see that a short working face simplifies organization of labor in mining because a smaller crew works on it and a smaller collective (20-30 persons) is easier to handle. This is the more important because about a third of the miners in the OKR are transient, so that fluctuation is so great that theoretically the entire complement will change in the course of a year. With a large number of transient workers, some of them have to perform skilled mining work after graduating from minimum instruction in mining. With the best of intentions these workers are of course not qualified to supervise what is going on in their immediate working area in addition to their own duties, or to quickly repair minor breakdowns in the equipment or to counteract them promptly as our miners did who knew the basics of carpentry, masonry and machinist work.

In this situation every leading worker tries to have the most visible section he can, with a small complement so that he can recognize personnel and keep them constantly under observation. and be able to intervene immediately in case of trouble.

Short working faces also have small capacities. In case, for example, of a breakdown in the transport equipment and stoppage of the operation the plant's loss in extraction is not as serious as in the case of a high-capacity operation.

As a rule one conveyer of a certain type is sufficient for a working face of the present length (about 100 m). For longer working faces, several units of them are usually required. With more sets on the operation there is a greater possibility of breakdowns, and it also causes overflow from one conveyer unit to the other. Of course under the First Republic some working faces were 200-300 m long, with considerably more primitive extracting, but nevertheless a few operation-cycle principles were achieved in them. But the skill of steady workers played a considerable part here.

The choice of shorter working faces is also influenced by the easier access to work in small-scale operations. The average size of the seams worked in some plants in the Ostrava part of the region vary around 60 cm. For the working faces to reach a capacity here of approximately 300 tons per 24 hours, they would have to be 250-300 m long. In this case some miners have to crawl up to 100 m to get to work. This way to work is of course very tiring for them, and, if it is cut in the working face, often very difficult. The tectonics of a minefield also affect the length of the working faces. In case of tectonic disturbances, the length of the working face must be chosen so that this disturbance affects the output as little as possible.

Prolongation of the existing length of the working face has certain advantages and deficiencies. It must be said that the advantages outweigh the disadvantages, as is shown by the facts from certain countries with well-developed coal extraction, such as West Germany et al. That is also why the plans for the Third Five-Year Plan were devised on the premise of prolongation of the average length of the working face and directly depend upon fulfillment of this task.

Great emphasis is placed upon increased labor productivity in the fuels branch in the Five-Year Plan, through increased mechanization and automatization. So far a whole series of mechanization means have been introduced in our mines, but there has been no substantial increase in labor productivity in proportion to the means expended. Mechanization has taken place only on major jobs, while mechanization of complicated jobs has not

received due attention, so that mechanization done this way has brought only partial progress to the plants. For example, in the OKR good results were obtained by combine extraction, yet there was no substantial increase of labor productivity, as the following review shows:

[see table on page 142]

In the Third Five-Year Plan mechanization and automatization will be carried on jointly, which will also accelerate labor productivity and improve the economic indices of the entire branch, and so the Third Five-Year Plan is counting on putting more combines, plows, channeling and other machines into operation and furnishing the working faces with all metal equipment. There will also be further automatization of the conveyor belts.

Elimination of fluctuation and decreasing the number of transient workers is also an important task in the Third Five-Year Plan. Development so far in this direction in the OKR has been unsatisfactory. To be sure, over a third of the transient workers are working in this region. There are plants here (Stalin and Trojice) that even have over 50% transient workers. Naturally there is also high fluctuation, often caused by inadequate housing, insignificant wage advantage, etc.

We regard it as a more complex problem, especially one of mining-work culture. In other branches of industry work culture is growing far more rapidly than in mining. That is why workers transferring to mining from other industrial branches are quite astonished at the low work culture. That is also why many leave mining for other, often less lucrative work, although they have favorable wage and housing conditions. It must be emphasized that the part of our miners who constitute the cadre of stabilized workers today live longer on the average and gradually go into well-earned retirement. And so more attention must be paid to stabilization of workers.

Besides the many advantages now offered by the mining profession, certain unfavorable factors also function to stabilize the cadres. Among these, the length of the working period ranks beside the low cultural level of the work. In this regard most mines, particularly in the OKR, are at a disadvantage as compared with some other industrial plants. For example, in most industrial branches the working period is reckoned from arrival at the plant; that is from the time of stamping the ticket at the entrance gate of the plant. In most of the OKR plants a shift is reckoned from assembling to departure because the so-called surface rotation has been introduced there.

Period	Extracted	Combines	Performance of machine in operation	Performance in cutting in combine operations	Performance in cutting, overall	Mine Performance
	1,000 tons	% of extraction from cutting	tons per month	tons per depth per shift [t/hl/sm]	tons per depth per shift	tons per dig per shift
1956	1,246	6.8	6,370	not observed	4,525	1,957
1957	1,394	7.4	7,170	6.03	4,691	2,014
1958	3,007	15.0	8,524	6.27	4,732	2,016
1959, first half	1,995	19.2	9,166	6.10	4,801	2,058

The rotation break, which is afforded miners for one of every four weeks as an advantage of mining, can not make up for the other loss in time. That is why in the directives of the Third Five-Year Plan the mining working period is expected to be lowered to a maximum of 40 hours a week.

At the present time analyses are being made as to how the working period is to be shortened. Several possibilities are being considered, for example, a 6 1/2 hour shift, an eight-hour shift and arrangement of a sliding break and a five-day week with eight-hour shifts. All expedients must be considered so as not to decrease extraction and not to interfere appreciably with the economic indices. But we are of the opinion that there should be a five-day work week in the OKR, which would be a very definite advantage and would contribute to stabilization of cadres. Young people would be attracted to mining because they would be assured of more free time for recreation and culture. Another consideration is the state of our miners' health. Among other advantages, we mention increased use of shifts. Although the use of shifts in mining (2.00) is among the highest in our industrial branches, it would be still further increased because a third shift would also be worked. There will also be other advantages here and of course disadvantages as well. Experiments with the introduction of the five-day working week that will be initiated in the first quarter of 1960 at Ludvik mine will show us how best to organize the work to make the five-day working week a success.

In connection with the development of soft-coal extraction, the question of the reserve capacities in the brown-coal pits must also be considered. Recently such extraction capacities were formed in the pits in the northern Czech brown-coal regions that a serious problem arose as to their use. The situation arose, that on the one hand the regions are capable of extracting more coal than the plan requires, and on the other hand the requirements of the consumers, who had previously demanded any amount of coal and taken all that was offered, declined below the plan. Gradually the necessary operating supplies were formed among the consumers, which react upon brown-coal extraction along with the certainty of regular reception of coal deliveries. Moreover, there was an increase in gasification and electrification in industry and in homes. Our workers, who could affect the specific consumption of fuel in their workshops to a considerable extent, also have a decisive effect upon consumption of fuels.

These facts resulted in new problems, especially as to the use of the existing extraction capacities of the brown-coal regions and determination of the optimum advance output in the brown-coal pits. Thus for example in 1959 about 50% of the capacity was used in coal extraction and on the overburden. The important question

is the operating costs, which amounted to about Kcs 28 per ton of brown coal extracted from pits in the northern Czech brown-coal region in 1959, and only about Kcs 15 in the Sokolov Brown-Coal Mines and Briquet Works. On the other hand, we have so far been extracting coal of the same quality from depth mines at considerably higher operating costs. In some brown-coal and lignite regions outlays per ton of brown coal or lignite extracted in 1959 varied around Kcs 134.

Our national economy is planned and considers factors other than operating costs alone. In the coal industry particularly this is a question of conservation of the coal resources, employment, and allocation of productive forces and transport. But nevertheless responsible workers in the coal industry will have to judge all questions on an overall basis, evaluate advantages and disadvantages, and judge from the point of view of the requirements of the national economy what is most advantageous at a given stage. The present situation greatly favors pit extraction. There is a higher technical level of mining machinery and equipment here, with high labor productivity with almost complete elimination of manual labor. Depth mines are far behind in this regard. Although it is entirely clear that the techniques of surface mining will remain at a higher level than those of depth mining in the future too, the present considerable difference will probably be diminished in part. We accordingly think that investment activity should also be judged from this point of view. The economic results of the coal industry would also be substantially improved thereby. The considerable investment means that have to go into depth-mine construction could be used for other industrial branches, in observation of the principle of even distribution of productive forces.

In the further transition to the heavy-machine concept of surface mining of brown coal, we regard the present lifetime of heavy machines and their performances in comparison with their weight as problematical. The problem will be best illustrated by comparison of a few types of heavy machines.

Type of Machine	Year of Entry into Operation	Weight of Machine (tons)	Theoretical Performance (m^3 per hour)	Life-time
Model Z 52	1948	2,830	1,900	35 years
Model Z 1800	1958	1,150	1,800	25 years
Model Z 1200	1953	650	870	25 years

Though the first type of machines has a greater rotation angle, etc., there are considerable differences in weights as compared with the differences in performance. And if we compare the years in which these machines were produced and put into operation we see that there was considerable technical progress in a short time. We therefore consider it correct to count on maximum use of these machines in the reduction of their present lifetime.

Better use of all heavy machinery is a prerequisite of improved transport. Transition from rail to belt transport is required for fluidity. At present belt transport has been installed in the A. Zapotocky pit in the SH [?] Region. According to experience with this pit, measures will be taken for the further development of transport.

Improvement of economy is also an important task in brown-coal extraction. Up to 1959 it was primarily a question of the quantity of the coal extracted, considerations of economy being largely disregarded. Now that we have reserve capacities formed and performance of extraction tasks no longer requires such working pressure as in the OKR, we must devote more attention to questions of economy, especially in the use of machinery.

We may say in conclusion that favorable conditions have been created in the fuels branch for systematic and purposeful improvement of the qualitative indices. New investments must build with minimum outlays in achieving progressive parameters. We must purposefully provide for the growth of labor productivity by over-all mechanization and eliminate the heavy and fatiguing labor of our miners.

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DETERMINING THE EFFECTIVENESS OF INVESTMENTS IN THEIR ALLOCATION TO DIFFERENT SECTORS OF INDUSTRY

[Following is a translation of an article by Valtr Komarek in Planove Hospodarstvi [Planned Economy], No. 2, February 1960, Prague, Pages 136-147.]

In allocating investments among the branches of the national economy and the various production sectors, we must proceed from the objective relationships of socialist economics expressed by economic laws, particularly the basic economic law of socialism and the law of the planned proportional development of the national economy. This means that first of all we must make a preliminary survey of the possible rate of development of the national economy in the long-term view and a preliminary comparison of the social product and the national income on the basis of the many fundamental studies of the possibilities of maximum development of the various branches. In this way we can arrive at an approximate picture of the possible height of the living standard at the end of the period considered in the prospective plan. On the basis of the height of the living standard determined in this way and an approximate determination of the structural changes in consumption (based on studies of the long-term growth trends of the living standard and the scientifically based norms of optimal consumption of certain products), we can make a preliminary determination of the consumption of foodstuffs, textiles, products of the machine, glass and lumber industries and other consumer-goods products, as well as cultural, housing and social-hygiene construction. This will give us a rough determination of the volume of production of the second group of social production, that of consumer goods. We can determine the needed production volume of production means for the second group on the basis of these data. Of course this still does not give us the volume of the first group. Production of production means must also be determined for the first group on the basis of the need of heavy industry to secure the specific demands resulting from certain inclusion in the international division of labor, reproduction of fixed capital, national defense requirements and certain others in the interest of the possibilities of technological development and the growth of labor productivity. It would seem that we must allocate investments among the various branches and production sectors precisely in accordance with these proportions and to secure them, and so investment allocation is determined by the objective relationships of the needed

proportionality in the national economy. Moreover some theoreticians have recently announced that the question of allocation of investments among the branches and production sectors is not subject to any check for effectiveness, and that its solution is automatically provided by the requirements resulting from the economic law of the planned proportional development of the socialist national economy.

But actually this question is far more complicated. The problem is that we can meet the same requirements of society in different ways. In particular, many of them can be met by producing various products that are quite replaceable as far as their utility value goes but have quite different chemical and physical properties and consequently require quite different materials and outlays. Thus plastics may successfully replace ferrous and non-ferrous metals. For example, the production of unsaturated polyesters, whose main application today is glass-textile laminates, will replace light metals (aluminum) and steel quite effectively, especially in the aircraft and automobile industries. Similarly, we could replace bricks with concrete prefabricates, wood with plastics, etc. Generally it is a question of many alternatives; for example, we can meet a given power requirement either with various kinds of coal (black, brown, lignite) or crude oil or fuel oil or natural gas or illuminating gas, electric power, etc.

The second great field of possibilities for the use of substitution solutions results from the fact that in a great number of instances one and the same product can be produced by quite different technologies. For example, electricity can be produced from steam, water, or atomic power stations, and illuminating gas can be produced by carbonization, pressure gasification of coal and by catalytic cracking of crude oil. Transport is assured by both electric locomotives and locomotives with internal combustion engines, and the production of machine parts and units can be assured both by casting them and by use of the technology of welded structures. We can process many machine parts both by hammering and pressing, as well as by casting in molds, etc. Of course different technologies are often used for different initial raw materials.

The third field of substitution solutions results from the possibility of various means of meeting certain requirements arising from the adjustment of supply and demand. We can meet the requirement for a given product in two ways, either by increasing its production or by reducing the requirement. Let us consider, for example, the coal requirement. To meet the requirements for a given increase in railroad transport we would have to secure an increase in coal extraction for the steam locomotives we would use. But we can also solve the problem by investing in electrification of railroad transport instead of in coal extraction. It is a well-known fact that electric locomotives are three times as effective as steam locomotives.

The fourth field, affording great possibilities for combinations and substitution solutions in investment allocation is the division of labor among socialist countries and foreign trade. Theoretically speaking, instead of investing in the growth of any kind of production we can also consider importing the product and investing in the production of an equivalent export. And in investing in export production we can very well also decide to invest in the production of laces or giant baggers (if we are considering it from the general theoretical point of view; in practice we must proceed from specific conjunctural and geographical analysis, which will considerably reduce our possibilities for combinations).

In conclusion, the fifth field of possibilities for combinations and use of substitution solutions is that of the living standard itself, or the field of consumer goods. For example, by planned development of cheap railroad and bus transport we can affect the demand and therefore also the production of private automobiles, etc.

But it can not be maintained that we have only variable quantities in national economic planning and can give reign to unfetered imagination. Practical national economic calculations, based on the actual possibilities of existing raw-material and material resources, limits our combination possibilities considerably and sometimes even very cogently. For example, while we have already determined the overall direction of the national economy and the growth of electric-power production that it requires, we have to follow a practically determined course of constructing electric power stations, in view of our very limited possibilities of using watercourses for power and the existing questions as to the use of atomic electric power stations. This is the course of building steam electric power stations burning domestic soft coal or fuel oils. And so even though we have envisaged great possibilities of national economic combinations and alternative solutions in investment allocation among the branches and production sectors, we see that in considering the planning of these combinations we must proceed on the firm ground of the actual possibilities of the national economy.

The above review of the possibilities of alternative solutions in investment allocation was not intended as an attempt to classification, but only at an informative review. There are definite economic points of view on classification for our purpose, which is investigation of the problem of determining the effectiveness of investments. We can divide the given cases essentially into two basic groups from these points of view. In the first group belong those alternative solutions in the case of which the substitutes are fundamentally distinguished by the material structure of the

consumed raw materials, materials and power and by the proportion (and absolute amount of consumption) of active [ziva], labor, and by the structure and amount of investment outlays and operating costs. These alternatives entail substantial changes in relationships among the branches. To the second group belong those cases in which there are no fundamental differences in the material structure, but rather differences in the amount of investment outlays and operating costs, especially as a result of the various absolute levels of consumed materials and power and particularly the various amounts of consumption of active labor. It is apparent that those alternatives are predominantly included here in the case of which one and the same product is produced by different technologies (hammering process, pressing, precision casting, etc.).

But the heart of our problem is how we are to determine and calculate which of the possible variants is most profitable for socialist society. This question appears very simple up to a certain point. Thus it is quite obvious that we must first of all compare the production operating costs for all the compared variants. But here there are already a number of complications. We must first realize that it is not sufficient merely to compare the production operating costs for the substitute products.

If for certain purposes 1 kg of plastics is substituted for 10 kg of steel, it is not sufficient to compare the production cost of Kcs 10 for 1 kg of these plastics with Kcs 8.50 for 10 kg of steel. We must consider what sort of finished product we are to produce and how different the processing costs of its production will be in the use of these quite different construction materials and of course also in the different technologies. Let us say we are going to produce processing machinery. Then, in using metal materials we shall have much hammering and heat processing, etc., and consequently high processing costs (wages of many metal workers, amortizations of many machine parks, maintenance, material wastage, etc.). With plastics hammering and heat processing are almost entirely useless and processing costs will be considerably lower. We must accordingly compare not only the production costs of these substitute materials but particularly the overall production of the finished product. But even this is still not enough in itself. A plastic lathe can have higher speed, greater durability, less need of repair, noiseless operation, etc., so that we must make still further comparisons to include costs of products produced on these processing machines.

Or let us take another example. In Paliva ["Fuels"], the organ of the Ministry of Fuels, No. 7, 1959, a very interesting analysis was published of the effectiveness of the use of various kinds of fuels for power purposes. The author, Mechanical Engineer

Stanek, on the basis of comparison of production costs per calorie for brown and black coal, crude oil and gas, concludes that brown coal is most suitable for power purposes. Obviously such an analysis is inadequate. An electric power station for fuel oil will unquestionably differ from one for coal: it will not have coaling equipment, coal mills, etc., and it will be simpler to service and maintain. Comparison of costs per kWh is the only reliable indication of which is most profitable. Accordingly, comparison of production operating costs of the variants must be carried out to the final stage of consumption and use.

Comparison of the production operating costs of the products in question is distorted by diverse cost reporting, sometimes conflicting facts, diverse methods of computing operating costs, especially in complex production operations (for example, crude-oil refining, production of hydroxide and chlorine, etc., or incorrect description of shop and enterprise operating costs in many industrial plants) and finally by the fact that with varying proportions of live and dead labor involved in the products compared, the actual value reporting in the index of production operating costs may be presented in distorted form. But these questions require separate analysis (they have already been analyzed to a considerable extent in Planovane Hospodarstvi).

And so we can correctly judge the production operating costs of compared ideas by a consistent overall approach to the alternatives under comparison.

The question arises whether such a comparison is adequate to enable us to make the best decisions. Many comrades, in view of the fact that all the live and dead labor expended upon a product is comprehensively expressed in operating costs (without the superproduct of course, but that is another problem), think such a comparison sufficient. But this view is incorrect. Investment outlays made just once, which we shall realize in the present period, and future production costs of operations built with these investments are not one and the same thing. To be sure, it is true that present investment outlays will become production costs of a future operation in the form of amortizations, but meanwhile the given period will run out and we must not overlook the particular factor of time. The fact is that there is in socialist expanded reproduction a non-antagonistic opposition between the powers of production growth and the unlimited growth of society's demands. Therefore in every prospective - plan period investment-construction requirements exceed the possibilities. A definite and generally very considerable group of investment requirements must remain unsatisfied in the plan, so that the question arises, if we are going to develop a given branch in the direction of products that require more investments than their

substitutes but are more expensive to operate, whether these "supplementary" investments, which would not have to be made otherwise, would not be more effective if used for these same unsatisfied investment requirements. For example, at the present time we do not have adequate means to modernize and renovate the processing industry's machinery park for the needed accelerated development of the raw-material and power base. But meanwhile we are making some very heavy investments, where we are making "supplementary" investments not for the purpose of growth, but primarily to economize on production. If we put on locomotives with combustion engines (requiring imported oil) instead of making these investments such as in railroad electrification (construction of converting substations, etc.), or if we invested in the construction of a considerably cheaper gas-works based on cracking crude oil instead of a certain pressure gas-works, we would then gain sufficient investment means to rebuild many plants in the processing industry (with a different accumulation structure, to be sure, which would create certain difficulties, but on that more later), with which we would achieve greater savings in a number of instances. Meanwhile with all these considerations we must take into consideration not only the amount of investment outlays, but also the length of the investment cycle. In the same way we must consider the billions invested in all the branches not so much as a means of increasing capacities as of modernizing them to economize on production, to mechanize manual operations, and the like.

It follows from the above that in allocating investments among the production sectors and in resolving various investment alternatives serving to meet these requirements, mere comparison of production operating costs is not enough to reach the correct decision, but that we must also consider the amount of investment outlays. If we find a solution among the compared variants that not only entails the lowest operating costs but also requires the smallest investment outlays, then the decision is generally simple. But the situation is different when the variant with the lowest operating costs requires higher investment outlays than some other possible variants. Then these higher investment outlays must be compared with the saving they make, and it must be considered whether the use of these "supplementary" investments, which are not unconditionally necessary from the point of view of the proportional development of the economy, would not make a greater saving in other production sectors. It is the well-known problem of commensuration of so-called supplementary investments with the saving in operating costs that these investments afford. The question arises whether judgment of the so-called "direct" investment outlays - that is, generally the estimated costs of the investment

under consideration, suffices for this purpose. It is evident that we must proceed primarily from these outlays. In addition to these "direct" investments there are "called up" ["vyvolane"] investments; that is, investments which, to be sure, are not comprised in the estimated cost of building a plant or construction but which must be made by other investors to make the operation or use of such a plant or construction on the whole possible.

We divide "called up" investments partly into those more closely connected in time and place with the realization of a given construction - various shifts of railroad lines and highways, changes in the distributing system, outlays to eliminate losses from investments, etc. In comparing investment alternatives we must take these investments into consideration. In my opinion it is not just the fact that it would be correct in comparing variants for us to charge the production costs of the appropriate products to the amortization of these "called up" investments in national economic calculations.

Suppose we compare the effectiveness of investments in the expansion of pit extraction of coal or in the production of an export equivalent enabling us to import crude oil. Then it will be correct to allow not only for amortization of extraction equipment and pit items in national economic calculations (in the calculation of costs of one kilo-calorie from coal) but also for the amortization of fixed capital, which had to be liquidated as a result of expanded pit extraction (liquidation of many dwelling houses and entire districts of mining towns, industrial plants in this locality, railroad lines and highways, depreciation of agricultural land, etc.).

The other group of "called up" investments are those that do not have such a close local connection with the plant or construction built and may have to be made in other production sectors and other branches of the national economy. It is a matter especially of securing the operation of newly built production constructions and a question of investments in building up the raw material base, expanding transport capacity, securing the power base for future operation, etc. This group of "called up" investments is never called indirect investments.

It appears at first glance that their inclusion in the calculation of the effectiveness of investments is superfluous. Supposing that if we put up a steam electric power plant instead of a hydroelectric one we must secure the needed coal extraction for this plant by building a new mine, the outlays for constructing this mine are still in the form of amortizations included in the cost of the coal purchased by the electric power plant and are included in the plant's production costs. And so if we compare the steam electric power plant's production costs with those of the hydroelectric one,

it appears that we have already included in this comparison the amount of indirect investments, albeit in special form. But the conclusion from this fact, that we do not have to allow for the quantity of indirect investments in our calculations of effectiveness, is illusory. This will be clearer from a specific example.

We shall consider the question whether to develop a given sector of metallurgy or the production of metal-substitute plastics. Suppose that 1 kg of laminates will replace 10 kg of steel (possibly sheets) and that the production costs for this substitute unit will be Kcs 14-16 for laminates and Kcs 9-12 for steel or a sheet. If, in accordance with the above principles, we carry out these outlays as far as the finished product, there will be a difference of Kcs 3-5 per substitute unit in favor of laminates, for example, but investments in the whole combine for the production of laminates for a given capacity will be considerably greater than investments in the expansion of a foundry to a comparable capacity. If we apply the well-known method of the coefficient of investment effectiveness in a given case, it will be 5%, for example. But other considerations indicate that if we make the same amount of supplementary investments in technical progress in other branches where we lack adequate investment means (for example, in the technical reconstruction of the processing industry) there will be a better result, which can be expressed by a coefficient to the amount of 8-9%. And so we shall more readily decide in favor of foundry construction in the light of the consideration that construction of a combine for polyester laminates would, no doubt, secure considerable operational savings, but compared with foundry construction it would require so much more investments that the use of these investments in other branches limited by lack of investment means would yield far greater savings. But the situation may be quite different if we also consider all the called-up investments in the national economy. In the investments in a combine for polyester laminates we have, for example, all the main investments securing the raw material base of production. Moreover only a certain part of the investments for the development of basic chemistry and securing aliquot power capacity will be needed, and it will require less investment in transport communications. On the other hand there will be no outlays for aliquot coking-plant capacities in investment outlays for the said expansion of a foundry. We must also allow for considerable investments in extraction and dressing of a corresponding amount of iron ores and extraction of coke coal to secure a corresponding power and transport capacity. But this is not all: we must have the finished product in mind. The use of laminates will involve a quite simple technology that will require considerably less investments for the needed increase in space and

equipment in the processing industry than in a technology based on the use of metals. And so if we consider all the investments in the national economy involving this or that program, we shall find that the whole investment program based on foundry construction will be considerably greater than the investment program required by chemistry construction. We originally decided in favor of foundry construction on the ground that though it is more expensive operationally it is cheaper from the investment point of view, which will enable us to make more effective use elsewhere of the investments we save this way. But now we find that foundry construction is more expensive both operationally and investment-wise, so that only an overall evaluation will show us the true picture. (It is of course an example of the method.)

But there are difficulties connected with the solution to this question. For example, in our example we shall want to determine all the investments connected with the above-mentioned foundry program. For foundry production we shall need coke, agglomerate, or for example in our instance colored clays [hrudky], coal for the production of generator gas for Martin furnaces (possibly fuel oil), electric power to operate rolling mills and all the other machinery, limestone and other admixtures, ceramics, foundry and other material for current repairs, water, etc. To secure all these requirements of foundry production we shall also have to invest in coking plants, clay plants [hrudkovny], electric power plants, coal and limestone extraction, production of ceramic material, transport communications, water-economy constructions, etc. Thus an almost endless chain of complications will stretch before us. Actually, this problem can be relatively easily solved in theory. With linear programming and other mathematical methods it is possible to formulate the appropriate equations, and all the above-mentioned difficulties can be overcome with the most recent automatic computers. But in our everyday practice in planning we can not yet make current use of these methods for a whole series of reasons, and so we must choose a solution that is a cruder, but accurate and practicable solution. It will be best for us to give a quite concrete example.

The present regular investment outlays per 1 kW of installed performance amounts to about Kcs 2,000 in the construction of large steam electric power plants and from Kcs 2,000 to several thousand in the construction of our large hydroelectric power plants, let us say Kcs 2,750 (after deduction of the share of investments in water power to maintain the water economy). To compare the two alternatives, we must also consider investments in coal extraction for steam electric power plants. It is a question of power brown coal, extracted primarily by the pit method, while the regular investment outlays vary around Kcs 40 per ton of annual production. In the

present large steam electric power plants the fuel requirement to produce 1 kWh varies around 400 grams of regular fuel, while the caloric value of power coal is half or even less compared with that of regular fuel. We must allow for about 0.8 to 1 kg of the current power coal to produce 1 kWh in our present modern electric power plants.

To make a comparison we have to put all this data on a comparable basis. Let us take 1 kWh for this purpose. The annual consumption of our present modern electric power plants amounts to about 5,000 hours. Let us allow for the same number of hours in this case for large hydroelectric power plants (actually a more complex calculation would be needed -- hydroelectric power plants are regarded as maximal in the first place, their active annual consumption in hours is lower, and a number of corrections would have to be made for comparison with steam plants). This means that the regular investment outlays per 1 kWh in the construction of steam electric power plants will be Kcs 0.40, and Kcs 0.55 in the construction of hydroelectric power plants. If we add the investment outlays for aliquot coal extraction to the regular outlays of a steam plant, it will come to Kcs 0.435. We shall consume about 0.07 kWh to extract 1 kg of brown coal. This means that investment outlays to secure electric power needed for the extraction required by increased power capacity represents Kcs 0.0032 per 1 kWh of "pure" production - that is, production used for new development of other production fields that is under consideration. And as we can tell from the previous calculation, the investments securing coal extraction for 1 kWh-power performance do not represent even 10% of the regular investments for this performance alone. This means that in our instance we shall add Kcs 0.435 (regular investments for securing electric power for this extraction plus the average investments for securing additional extraction for this "derivative" power production) to the original Kcs 0.435 (regular investments for 1 kWh and regular investments for securing aliquot coal extraction for this production). Only direct investments for 1 kWh and indirect investments in extraction growth, securing this additional power capacity, would be needed for this general consideration. Additional inclusion of investments for the electricity that this extraction will require, as well as the extraction for this electricity, or continuing in these constantly diminishing circles, has no appreciable purpose. (It is merely an example to illustrate the significance of the method and accordingly not an actual evaluation of the effectiveness of building steam electric power plants as opposed to hydroelectric ones.)

But it is not sufficient always to include only indirect investments of the so-called "first circle". For example, to secure the needed growth in the production of pig iron we must invest in an aliquot growth of coke production. To secure an annual capacity of one ton of pig iron we need, for example, Kcs 1200, about 900 kg of coke being required to produce one ton of iron. Average investments for one ton of coking-plant capacity amount to about Kcs 280. Therefore to secure annual production of one ton of pig iron we need in our instance Kcs 1200 of direct investments in foundry production, as well as Kcs 250 of indirect investments in coke production (280 x 0.9). To produce one ton of coke we need about 1.4 + of coking coal, the average investments to secure one ton of annual extraction of black coking coal amounting to Kcs 400. Accordingly in a given instance it would be inadequate to take account of indirect investments in the so-called "first circle" only.

And so we see that the indirect-investments circle, which must be included in resolving the various variants, can not be defined the same way in all instances. It depends upon the nature of the instance in question and requires an individual approach.

In conclusion we must also decide the question of the inclusion of indirect investments in the line of accumulation. That is, the fact is that frequently along with investment in the main production we invest in those securing circulating capital for this production as well as in the production base alone that produces the investment means to carry out this program.

If we decide to secure the entire needed growth of power performance by the construction of steam electric power plants, we must, for example, in a specific situation invest not only in expansion of the appropriate power - coal extraction, but also in heavy-machine construction plants (producing power equipment) and possibly in their metallurgical base (forges, foundries). Or on the other hand, if we decide to cover the given increase in electric-power production by building hydroelectric power plants, we may have to invest in a considerable expansion of the production capacity of cement works, etc. It is generally pointed out in the literature that it is difficult to include investments of this kind, since if we can reckon with a systematic and permanent connection in the case of circulating means, then there is no such connection in the case of accumulation.

If we are building a steam electric power plant, for example, we generally have to secure a certain growth of power-coal production capacity, which will actually be constantly connected by the production of electricity, since it is a matter of a systematic, daily and also permanent consumption of coal to produce electric power. On the other hand, if we also have to invest in the expansion of the

production capacity of heavy-machine construction and machine-construction metallurgy to secure this construction of steam electric power plants, we must then allow for the fact that after we secure the construction of a given number of electric power plants the said foundries, forges and heavy-machine construction plants will be producing something else again, perhaps sugar-refinery or other equipment.

As regards indirect investments in the line of accumulation, there is not so close a connection there with the constructed main capacity as in the case of indirect investments in the line of circulating means. But indirect investments must nevertheless also be considered in the line of accumulation. This is apparent from the fact that a given national-economic variant of investment construction is connected not only with various amounts of production operating costs and various amounts of investment outlays, but it also affects the whole machine-construction structure and thereby foundry production as well, and that the whole complex of these relationships must be included, which is impossible unless we consider indirect investments in the line of accumulation too. Moreover in the case of many direct investments in the line of accumulation one can speak of a very close and long-term connection with a given investment program.

And so in the comparison of the variants we allow for indirect investments both in the line of circulating means and of accumulation. This inclusion of indirect investments in the line of accumulation is difficult in practice. But it is often a question there of the above-mentioned short-term connection and also of the fact that all this "previous" accumulation will generally amount to only a small percentage of the required "future" accumulation. It is also a question of the considerably relative nature of this inclusion - of course there is no point in going centuries back to some original accumulation. It is finally a question of the fact that the final considered accumulation of the various variants requires securing a production base for it of an analogous nature (machine-construction plants and the production of construction materials), and in many instances there will be no essential differences. The inclusion of indirect investments in the line of accumulation is consequently in point only in the case of a very long-term program that requires very different volumes of investments in the production base of this accumulation.

And so we reach the conclusion that in calculations of the effectiveness of investments in their allocation among the branches we must allow for both direct and called-up investments, taking indirect investments into consideration both in the line of circulating means and accumulations. In deciding in which branches or fields to

invest it is not sufficient just to compare the production operating costs of the alternatives under consideration, even if they are carried out to the final stage of the use of the product, but it is also necessary to consider the investment outlays. If some of the compared alternatives afford not only the lowest operating costs but also the least investment outlays, the solution is then usually simple.

We encounter a more difficult problem when an investment program with the lowest operating costs also calls for greater investment outlays than certain other of the possible alternatives. In such a case it is a problem of comparing the socalled "supplementary" investments with the saving on production operating costs. In economic literature this problem is usually resolved by introducing the so-called coefficient of effectiveness of investments, according to the formula $\frac{V_2 - V_1}{I_1 - I_2}$, where V_1 and V_2 are the production operating costs and I_1 and I_2 are the investment outlays for the various variants.

It usually depends on the fact that such a coefficient is to be determined for the national economy on the basis of an overall analysis - say 5 or 10% (possibly differentiated for certain branches). All solutions not covered by this coefficient must be rejected in making supplementary investments, so that we might say in the spirit of these concepts that in allocating investments among the branches and production fields we must consider not only the operating costs but also the investment outlays (including indirect investments), and if supplementary investments are needed in certain cases to lower operating costs, then the effectiveness coefficient of this solution must be computed and compared with the coefficient, determined by norms, for the national economy (or branch). We shall accept or reject a given solution on the basis of this comparison.

But it would be incorrect for us to adopt these ideas wholesale in our case, where it is a matter of allocation of investments among the production fields and branches. But of course the normative coefficient of the effectiveness of the investments for the national economy (including its possible differentiation by branches) can not be determined in any other way until we have the whole plan balanced in principle and assured of an uncovered potential of technical development, which could give us definite savings in production operating costs in their realization. The most effective of these uncovered potentials could determine the lower limit for us in determining the coefficient of effectiveness of the investments. But in our case we do not as yet have any such coefficient available. If for example the effectiveness of the development of certain productions of plastic materials instead of the development of foundry production can be expressed by an

investment effectiveness coefficient of over 12%, we still can not say whether it is good or bad. And so in the allocation of investments among the branches and production fields we can not be governed by a ready-made, normatively determined effectiveness coefficient in the initial stage of drawing up the plan, but only by this coefficient's method - that is by continual comparison of the amount of the supplementary investments with the saving in production operating costs secured by these supplementary investments, and by systematic consideration of the possibilities of another, more effective use of these supplementary investments, and by systematic consideration of the possibilities of another, more effective use of these supplementary investments.

But there is another more cogent reason that prevents us from allocating investments among the branches and industrial fields simply, if there are substitution decisions, according to the determined normative coefficient of the effectiveness of the investments. We see that the effectiveness of investment construction is part of the overall effectiveness of the general development of the economy, which effectiveness results from several factors, one of which is the most economic use of investment means, the use of the most suitable kinds of raw materials, etc. Another favorable factor in this active area is the profitable introduction of the country into the international division of labor and the like.

In national-economic analyses of the effectiveness of investments we shall not take a one-sided view only of how economic a use of investment means is but a synthesized view of how all the factors of the effectiveness of economic development figure in a given investment program. We consider the investment variant the most effective that enables us to coordinate all the factors in the maximum effectiveness of the national-economic development. But meanwhile we must not drift into abstractions and overlook the fact that in a specific economic situation these factors figure quite concretely, and their extent and potential uses are presented and defined in a definite way.

Analyses of the effectiveness of investment construction can not be divorced from those of specific material and other balances. And we see in the course of such a procedure that the criterion for the coefficient for the allocation of supplementary investments is a narrow one. We shall see this from an example.

We are now considering whether to build large gas works based on burning coal under pressure to meet our gas requirements or gas works based on the catalytic cracking of crude oil. Pressure gas works produce gas at 25% lower production operating costs, but the regular investments for their construction are five times higher than in the case of gas works based on crude oil. Let us assume

that the effectiveness of the construction of the gas works can be expressed by a coefficient of 3%. The final balancing of the potentials and the requirements of accumulation will show that the national economy still has great possibilities of technological development not covered by investments that can be expressed by an effectiveness coefficient of over 10% (for example, general modernization of the machine park in the textile industry, or mechanization of beet storage in sugar refineries, etc.). It seems quite plain then that instead of pressure gas works we must build ones based on crude-oil cracking and make more profitable use of the investments released this way for other purposes of technological development. But suppose the possibilities of crude-oil imports are limited and we can use the limited quantity of raw material far more effectively for dieselizing railroads instead of investing in their electrification. The effectiveness coefficient will not give us the answer here. We can not always assume by any means that the variant among those compared whose operating costs and investment outlays are both the lowest is the most profitable.

Let us assume that the railroad dieseling program will be cheaper from the investment point of view than electrification (by Kcs 1,000,000,000) and will also guarantee Kcs 100,000,000 annual savings on operating costs. It then appears that the dieselizing program is unquestionably more profitable. But let us also suppose that this program involves the entire amount of crude oil for the national economy, while by the use of this crude oil for the construction of gas works based on crude-oil cracking we would save perhaps Kcs 10,000,000,000 in investments compared with the construction of pressure gas works. Of these Kcs 10,000,000,000 we would have to allocate Kcs 1,000,000,000 to electrification of railroads (the difference compared with dieselizing) and we would use the remaining Kcs 9,000,000,000 investments as supplementary investments for the technological reconstruction of the textile industry. This would give us a Kcs 630,000,000 saving in operating costs (an effectiveness coefficient of 7%). Therefore if we dieselized instead of electrifying we would gain Kcs 100,000,000 annual savings on operating costs in transport and Kcs 70,000,000 annual savings on operating costs in the textile industry, which we would accomplish by using the Kcs 1,000,000,000 released investments for technological reconstruction of the textile industry. In investing the same overall volume of accumulation we therefore shall gain Kcs 170,000,000 annual savings, (while in the program of railroad electrification and construction of gas works operating on crude oil we shall gain almost four times as much (Kcs 630,000,000)).

In the complicated interrelations of the national economy, we shall not be sufficed with any relatively simple formulae. We shall have the correct answer only if we cast each of the many alternatives in its specific material structure into the balance of the social product (of course we shall confine ourselves to the basic relationships) and give general consideration to all its direct and indirectly arising advantages and disadvantages. On the other hand it can be objected that such a procedure is too complicated and can be effected only by a method of chessboard balancing of inter-branch relationships (presuming the use of the most perfected computing machines), which means that it is possible only in the quite distant future. But such an objection is incorrect. We believe that this procedure is possible even with the methods and potentials we have at our disposal today in national-economic planning by the following method:

If we have investment construction to secure certain requirements of society, we must first determine all the possible variants and give them their numerical and natural characteristic. Mainly we must compute the production operating costs in accordance with each variant, corrected of course as far as the field of final consumption, and also the investment outlays, of course both direct and indirectly arising. In addition we must also note the essential differences in the construction cycles and in the turnover rate of current means, the differences in the structure of the labor used (proportions of dead and live labor), the differences in the material structure of the consumption of raw materials, materials and power and the structure of the required investments, and finally the essential differences in the effect upon the balance of foreign trade. In the next step we investigate whether among these variants there is one which is characterized by both the lowest operating costs and the lowest investment outlays, which is generally coupled with relatively short construction cycles and rapid turnover of current means. If such a variant exists, it remains only to investigate whether its execution involves any raw material in short supply, other uses of which would give greater savings, or whether it would interfere with any very profitable ventures in the international division of labor. Analysis of these relationships will enable us to find the correct solution. But it often happens that such a variant does not exist, and that a variant with the lowest operating costs requires higher investment outlays than any others in its execution. We must then use the method of the coefficient of the effectiveness of investments, along with analysis of relations to the raw material base and connections with foreign trade; just

as in the preceding case. In all these analyses we shall be satisfied with the above-mentioned indices (production operating costs, regular investment outlays, etc.), which are regularly recorded in accounting and which we can responsibly develop from regularly quoted planning bases. Analyses of these indices will give us, indirectly but accurately enough, the decisive criterion of the overall effectiveness of the economic development, which is directly expressed in the maximum growth of the physical volume of the national income with the relatively lowest volume of accumulation invested in this growth and the lowest volume of invested labor. Perfection of the methods of chessboard balancing of the social product with the use of the most modern computing machines will enable us to express these decisive criteria directly and use them practically in drawing up the prospective plans of the national economy.

- END -